INDUSTRIAL ARTS and VOCATIONAL EDUCATION

PUBLISHED MONTHLY BY

THE BRUCE PUBLISHING COMPANY
524-544 NORTH MILWAUKEE STREET
MILWAUKEE, WISCONSIN

WESTERN OFFICE: 66 E. SOUTH WATER ST., CHICAGO, ILL.
EASTERN OFFICE: 40 EAST 34TH ST., NEW YORK, N. Y.

VOL. 21, NO. 7 JULY, 1932

TABLE OF CONTENTS

The General-Shop Idea, *by Earl L. Bedell* 205
Elements of Response to Federal Stimulus in Vocational Education, *by J. V. Lynn* 211
Hygiene of Vision in the School Drafting Room, *by A. K. Rigast* 213
Editorials 216
Back in the Nineties, *by Charles A. Bennett* 218
One-Tube Teachers, *by Laurence Parker* 221

SUPPLEMENTS

Free-Hand Sketching, Plates VII and VIII, *by Jonathan Bright* ....No. 246
Story of the Hammer, *by Clifford B. Smith* .....No. 247

PROBLEMS AND PROJECTS

Free-Hand, Third-Angle Projection for Beginners in Mechanical Drawing, *by Jonathan Bright* 222
The Marimba, *by S. A. Woodbury* 222
Flowerpot Holder, *by H. M. Andersen* 223
Making a Folding Bridge Chair, *by F. Clarke Hughes* 223
Combination Stepladder, Stool, Storage Cabinet, *by R. M. Hammes* 225
Two Plastic-Wood Substances, *by Charles M. Rice* 225
File Holder, *by F. N. Newton, Jr.* 226
A Sheet-Metal Side Wheeler, *by R. W. Wagner* 227
Fruit Bowls That Are Different, *by Wayne M. Judy* 228
An Oval Frame, *by Hazel F. Showalter* 229
Student Progress Card, *by Chester A. Lyle* 230
Wire Bander, *by J. Trus Hayes* 230

Among Industrial-Arts Teachers 231
Now, Are There Any Questions? 231
Association and Convention News 231
New Publications 232
News Notes 232
School Shop Equipment News 9a

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1932, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.

Subscription Information — Subscription price, $2.50 per year, payable in advance. Canadian postage and tariff, $1.00, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions—The Editors invite contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

VACATION DAYS

The work and worries of the school year are over. Vacation time is here. To the one this means an opportunity for entering the domain of everyday work, there to acquire practical experience or to earn additional money. To the other it means attending summer school. To a third it means traveling. To a fourth it means sojourning among the hills and dales. To a fifth it means a restful relaxation in home surroundings.

Vacation days, no matter how spent, are to prepare the teacher for the next school year so that he can tackle the problems of the classroom with more vigor, and arrive at a proper and efficient solution more easily.

Wherever you are, whatever you do, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION hopes that your vacation will be both enjoyable and profitable to you.

THE POSTER

As in previous years the July and August issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will carry no shop posters. Their publication, however, will be resumed in the September issue.

THIS MONTH'S COVER

The picture on the cover this month shows the charging side of a battery of open-hearth furnaces. The big ladle in the center is emptying molten metal from the blast furnace into the open-hearth furnace, there to be converted into steel.

Photo courtesy American Steel & Wire Co., Chicago, Illinois.

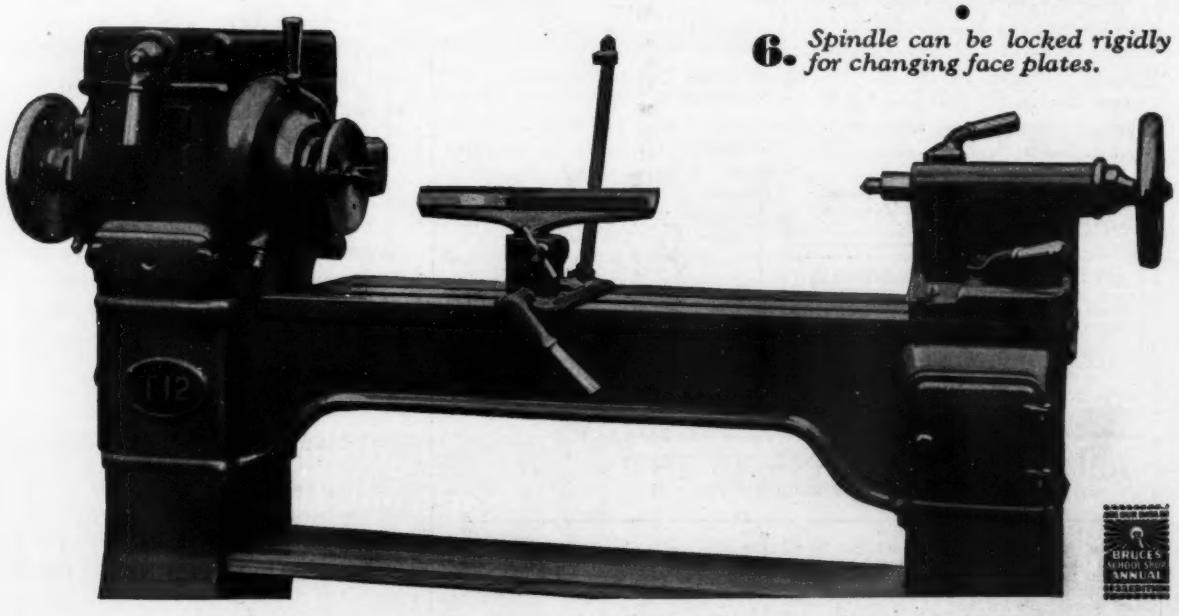
The Safety Lathe that . . . . Modern Instruction Demands

STUDENTS like to feel that they are learning a trade with machines such as they will use in actual work after they leave school, and instructors too are equally interested in using such tools in their class work. Furthermore they demand machines that are easy to adjust and operate and offer as much protection to the students as it is compatible with the work they do.

In the new T-12 SPEED LATHE we have combined skillful design and accurate workmanship,—essential requisites of the machinery intended for industrial plants,—and the simplicity of adjustment, the ease of operation and the safety features demanded by progressive instructors of our vocational and manual training schools.

Safety Features

1. *Motor cannot be accidentally started by moving the speed control lever.*
2. *Motor will start only when control lever is at lowest speed position and start button is pushed.*
3. *Top of push button is slightly below surface to prevent accidental starting.*
4. *When brake is applied the current is automatically shut off. Pressure on brake shoe is even regardless of pressure applied to lever.*
5. *Tool rest is universally adjustable with clamp lever in front, convenient to operator.*
6. *Spindle can be locked rigidly for changing face plates.*



YATES-AMERICAN

YATES-AMERICAN MACHINE COMPANY

Vocational Division

Rochester, N. Y. **BELOIT, WISCONSIN, U. S. A.** **Hamilton, Canada**

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOLUME 21 JULY, 1932 NUMBER 7

The General-Shop Idea

*Earl L. Bedell**

THE general-shop idea has come in response to a demand for socialized courses. It seems to be the consensus of opinion of those leaders who are best acquainted with the problems and objectives of the junior high school that shop courses should be of a general nature. It is quite generally recognized that the outcomes of our instructional efforts are measured to a great extent by the manner in which our pupils fit into their community life. There are many persons who believe that social efficiency may be a greater factor in an individual's success than his technical knowledge or his possession of manipulative skill. Being aware of the importance of the social-efficiency factor should not lead us, however, to neglect the development of skill nor to place less emphasis on the acquiring of technical knowledge in the industrial-arts subjects. Rather, let us believe that it is possible to include this desirable training without detriment to the essential instruction in skills and technical knowledge. It is not suggested that training in social efficiency should supplant what have been so long considered the essential elements of shopwork. It is being suggested, however, that desirable traits of behavior may be developed in the pupil through participation in a good shop organization. It would seem that the development of such traits as represented in the following situations should become an integral part of shop instruction: (1) taking orders from a superior, (2) giving orders to helpers, (3) assuming responsibility for getting things done, (4) participation in planning an organization, (5) accepting duties for the good of the school.

These situations cannot be made a concrete, tangible part of the course-of-study content. However, the course of study can be so arranged that the situations which will promote social development will become an inevitable part of the outcomes of the instruction. In other words, the organization of the teaching material, the management of the class, and the type of teacher administration are the things, apart from the subject-matter content, which effect instruction.

Organization

There have been two developments in industrial-arts instruction which have contributed to the social objectives. The first is "The Organization of the Subject Content for Shop Courses" and the second is "The Organization of a Pupil Personnel." It would be impossible to discuss one of these developments without discussing the other also. They are inseparable. In fact, one development could not proceed without the other. Nevertheless, for the purpose of clarifying this discussion, each development will be treated under its respective heading.

The Organization of Subject Content for General-Shop Courses

The subject-matter content of industrial-arts courses has undergone more radical changes in organization than in actual ingredient. There is a demand for general rather than narrow courses. Those who have given careful thought to the problems involved in offering general courses readily admit that a course can be so general that nothing definite is accomplished. On the other hand, some of the unit courses of the past were so highly specialized that the pupil could find no application for the things learned unless he happened to become attached to the particular trade or industry represented by the unit course in which he had received his training.

As previously explained, general-shop courses have come into being in response to a new philosophy in education. The new shop courses are of such a nature that they require general shops in which to teach them. It is logical, therefore, to assume that a course of study in the industrial arts would be a growing thing, and as the scope of the course became broader the shop facilities must be adapted to the newer and changed needs.

Basic Processes

More recently a new attitude toward the general courses has appeared, especially in its application to the use of the tools and the materials of various trades and industries. There have been attempts to make courses of study composed of "basic selections" rather than "general selections." There appears to be a rather nice distinction between the words "basic" and "general." Take for example the tool process of planing with a jack plane. It is a "basic" process in all woodworking trades. Following the same line of thought, an analysis of many woodworking trades will show that (1) boring holes with an auger bit, (2) sawing with a hand saw, and (3) smoothing with sandpaper are basic processes in all woodworking trades. If a pupil were to receive good training in as many of the "basic" processes as the time permits it would be reasonable to say that the pupil has had a good "general" training in the woodworking field. But it is well to be aware that a good general training in any field has as its ingredients the "basic" things. Emphasis should be given the idea that the number of "basic" things to be included in a "general" course is limited to the number of things that can be taught to the desired degree of attainment. If more than that number are attempted the course becomes so general that nothing is sufficiently mastered to be of benefit to the pupil from a practical point of view. Not only that, there are apt to be undesirable traits developed, such as (1) inattention, (2) dawdling, (3) lack of careful thinking, and (4) lack of thoroughness. General courses, therefore, should provide instruction in the basic processes, operations and uses of materials by teaching the things that are "basic" and common to the trades involved in the course.

Detroit's General Shops

With this understanding of the word "general," Detroit is committed to a program of general courses for shopwork in

*Assistant Director of Vocational Education, Detroit, Michigan.

her intermediate schools (junior high schools). Unit courses such as manual-training benchwork in wood, patternmaking, machine-shop, and garage service work, have been discontinued. Manual-training benchwork in wood as an introductory course in shopwork for the seventh grade has given way to a general course involving a variety of processes and materials. Patternmaking has become only one of several units in a general woodworking course. Machine shop in the intermediate school has been changed from a course in engine-lathe operation to a general course which includes the principle hand-tool processes of many metal-working trades and the use of a larger assortment of metals.

There are at least four industrial-arts courses in the Detroit intermediate schools which may be classified as general-shop courses. They are household mechanics, general woodwork, general metal work, and auto mechanics. These courses are "general" in the sense that in each case the course content is organized into instructional units each taken from different trades.

A general shop may be defined as a shop in which a variety of stations or places to work are provided. Each station represents a workbench, a machine, or other suitable equipment for doing a specialized job. Detroit shops are uniformly equipped with forty stations, thus providing the opportunity for forty pupils to work individually so far as equipment is concerned.

The course of study to be taught in a general shop dictates the kind of equipment at the various stations. There is, for example, in the shop used for household-mechanics instruction, a large electrical bench which provides six stations for electrical work. There is a plumbing unit consisting of faucets, sink and a drain, with a workbench near by. A long heavy wall bench fitted with machinists' vises provides stations for pupils to do metal work. There is a sheet-metal bench with gas furnaces for heating soldering coppers. The woodworking benches take up more than half the shop because these benches lend themselves to a variety of jobs, such as glazing, work with locks and hinges, as well as woodwork.

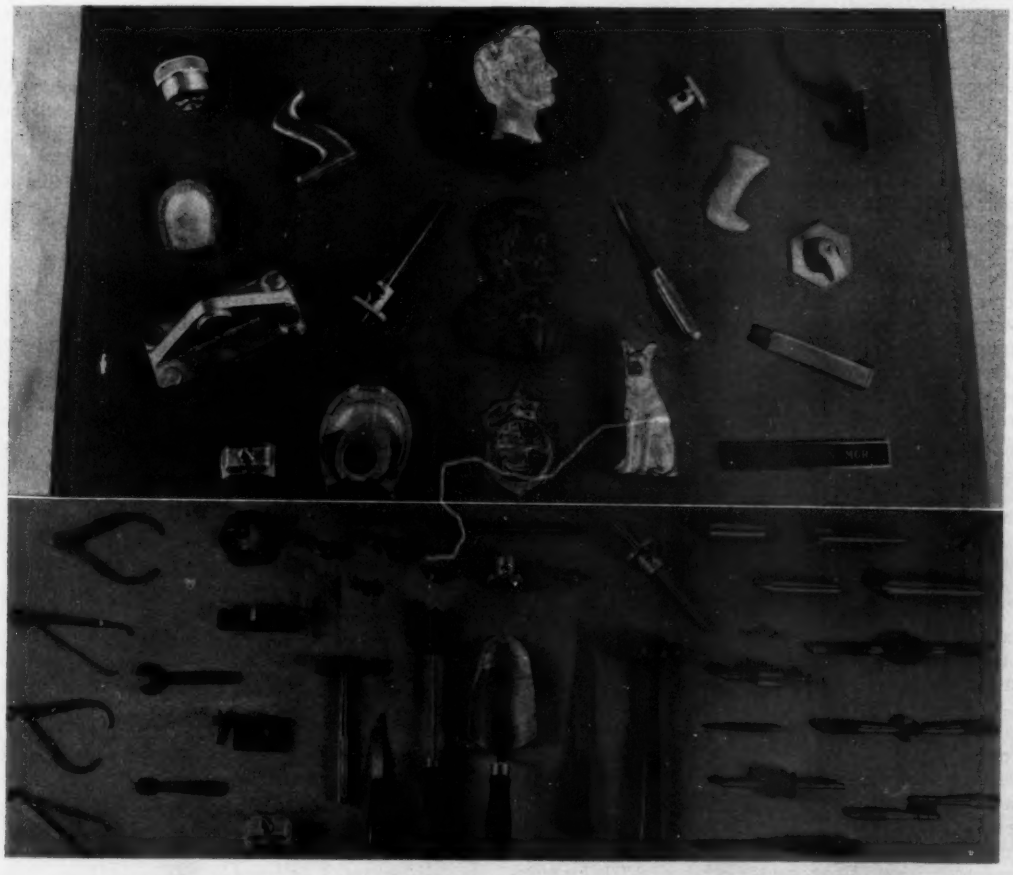
General Shop Adapted to General Courses

The general-shop organization lends itself to the teaching of general industrial-arts subjects because it permits the use of a variety of equipment which is made available for reducing and forming a variety of materials, and the accomplishment of many types of mechanical assemblies. Not only is this equipment available, but in the interests of efficient operation it is in use simultaneously. This means that one group of pupils will be using the electrical stations, another group the metal-working stations, and still another group the woodworking stations. Each pupil, however, will be working as an individual doing an individual job.

Job Sheets and Core Jobs

The subject matter of shop courses for the junior high school can be taught through the medium of core jobs. The core job is one selected by the teacher for demonstration and as a basis for giving the pupil practice in developing skill. Such jobs, if interesting, have been found better than exercises.

The core job is demonstrated by the teacher to the entire class. The success of teaching in a general shop is more dependent upon the class lesson and demonstration than on any other single factor. The demonstration of tools, tool processes and operations and the use of materials requires the



THE GENERAL METAL SHOP PROVIDES OPPORTUNITY TO WORK IN MANY KINDS OF METAL

utmost skill. In the same way that a vaudeville player sets the stage for his act, so should the teacher have the demonstration material carefully arranged, and have ready a carefully prepared explanation to cover each operation demonstrated.

The demonstration should provide the pupil with material for a plan of work or job sheet. The plan of work may be written by the pupils or it may be supplied by the teacher in the form of a job sheet.

The core jobs are the simple jobs selected by the teacher for instructional purposes. Additional jobs are available to the pupil as soon as his ability has been demonstrated by doing a core job successfully. The jobs selected by the pupil should be the ones in which the pupil can show his originality and initiative.

At this point, a warning may be sounded. Writing in notebooks should be kept to a minimum if the pupil's interest is to be sustained. Lecturing and extensive supplemental or loosely related discussion in the class demonstration should be avoided. It should be borne in mind that the function of a shop is to provide the pupil with the opportunity to work with tools and materials, not to write essays or listen to lectures which do not bear directly on the job. The effectiveness of the demonstration will depend largely on how well the teacher heeds this warning.

The Detroit courses of study contain a list of core jobs which have been found good in connection with each unit of subject matter. The teachers are requested, however, not to use the same core job year after year. The observing, wide-awake teacher will find new jobs to meet the requirements each successive term. Change is the spice of life in shopwork as well as elsewhere.

The following abridged outlines will indicate the nature of some of the general-shop courses now being used in the Detroit intermediate schools.

Outline of Course of Study in General Metal (Intermediate School)

The course in general metal is designed for ninth-grade boys of the intermediate school. The time is one clock hour a day for twenty weeks.

Equipment	*Supplies*	
10 Engine lathes	Sheet metal	Kesenite
1 Milling machine	Cold-rolled steel	Lead, white
1 Shaper	Cast iron	Lead
2 Drill presses	Tool steel	Oil, soluble
1 Forge and melting unit	Aluminum	Oil, engine
1 Tool grinder	Brass	Screws
1 Metal saw	Copper	Rivets
1 Large bench and vises	Pipe stock	Bolts
Necessary hand tools	Emery cloth	

Purpose of Metal Work

That the course in metal work in the intermediate school should be a "general" course, seems to be the opinion of those who are best acquainted with the problems and objectives of the intermediate school. Several teachers of metal work have done extensive experimentation to determine the contents of a course in general metal work. It is agreed that it should be interesting and practical; it should be taught so that it might be of definite exploratory and prevocational value. In addition, it should be rich in information of value to all boys irrespective of their future vocations; it should give the student an overview of the metal-working industry in as many of its different phases as possible.

Method of Instruction

A general metal course would imply a variety of shop experiences through projects in metal. The general-shop organization seems to be the best method for carrying on a number of different activities simultaneously in one shop. The teachers of general metal, therefore, are advised to study the shop organization used in the teaching of household mechanics, and to adapt as much of that type of organization to the metal shop as possible.

During the study of any of these units, teachers are asked to observe the following approximate time distribution: The time given to each unit may be divided into two parts, one part taking about 80 per cent of the pupil's time to be devoted to the various jobs with tools. The rest of the time — about 20 per cent — will be spent in demonstrations, study of reference material, and class discussion.

There is a fund of related information to be gained in these units of work, but the intermediate-school boy can be given most of this information through the medium of actual construction. Extended lectures by the teacher and lengthy written descriptions in notebooks have been found to defeat the very purpose for which they are intended.

Careful demonstrations should be given by the teacher and sometimes by the students themselves on the processes and operations. The best methods of performing the operations should be studied and such reference material used as will help the students to understand the fundamental practices and functions of metal work. Emphasis should be placed upon the use of a correct vocabulary as related to the names and uses of tools and materials.

Organization of Subject Matter

The course is divided into four major units of subject matter, namely, (1) benchwork in metal, (2) power-driven machine-tool operations, (3) forging and heat treatment, and (4) molding and melting of metals. Equal emphasis should be given to each of these four units.

Each unit has a list of suggested jobs. All of these jobs cannot be attempted by all the pupils in each class. Therefore, the responsibility and privilege of selecting jobs, that is, articles to be made, are left with each individual shop teacher. It is felt that the teacher will thus be free to adjust the course to meet the needs and interests of individual students in each community. As far as possible, articles that are useful should be selected. Mere exercises, as such, do not fulfill the requirements of the intermediate school. The problems suggested indicate the types which have been found practical by many successful teachers of general metal work. Articles of use to the school organization are preferred.

The processes and operations listed with each unit represent the activities in which a student should develop some skill and understanding. The ability to perform these activities must be measured with due regard for the limitations of a ninth-grade boy.

Unit I. Bench Work in Metal

1. *Processes and Operations*

Holding work in vise. Laying out work with scriber, prick-punch, dividers, center punch, rule, centering square. Sawing metal with hand hack saw. Filing — rough, smooth, and to dimension and draw filing. Polishing metal with emery cloth. Bending, twisting, and forming cold metal. Riveting — fastening by riveting. Cutting metal with a cold chisel. Cutting with tin snips. Threading and tapping with taps and dies. Use of wrenches — adjustable or open-end — assembling with bolts. Pressing work on a mandrel with the arbor press. Measuring — calipers, micrometers, rules, and squares. Punching holes in metals. Metal stretching, forming, and piercing. Soldering. Designing. Metal spinning.

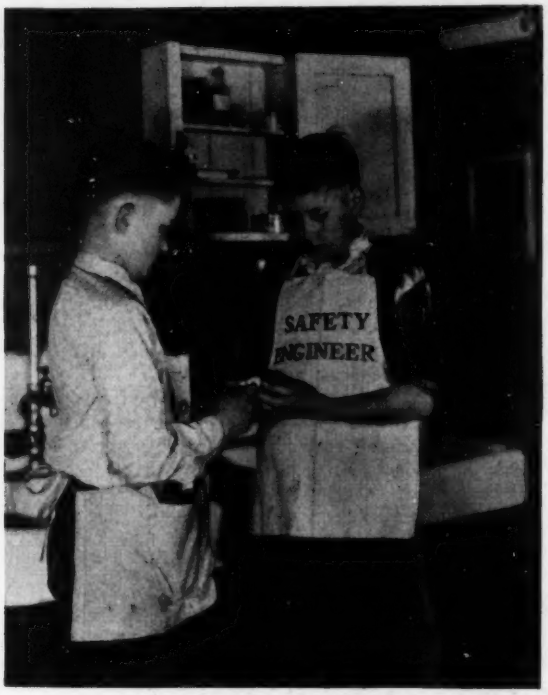
2. *Suggested Jobs*

Caliper; wrench; garden trowel; paper knife; letter opener; tray; ornamental pin; watch fob; letter holder; book ends; desk set.

3. *Informational Material, References to Tests, Lesson Sheets, Catalogs, etc.*

Discussion and study of metals used in handwork, handwork before the machine age, present use of handwork in industry, safety conditions, and safe practices applying to benchwork in metal.

Reference material: *American Machinists' Handbook*, "Bench Work" (Burghardt, Part I), job sheets, catalogs, and circulars.



THE SAFETY FOREMAN HOLDS AN IMPORTANT POSITION IN THE SHOP ORGANIZATION

4. *Outcomes and Degrees of Attainment*

The general purpose of this unit is to teach boys how to design, shape, form, finish, and assemble simple metal projects with the aid of hand tools.

Unit II. Power Driven Machine Tool Operations

1. *Processes and Operations*

Safety practices. Proper care of machine tools. Oiling machines. Starting and stopping machines. Adjusting feeds and speeds. Mounting work in machines. Sawing with power hack saw. Center-drilling in lathe and drill press. Rough-drilling in lathe and drill press. Taper turning with tailstock set over. Turning work in a lathe to a given measurement. Knurling by the use of a knurling tool. Chucks and chucking. Finishing and polishing in the lathe by file and emery cloth. Shaper work — rough, finished, and square. Plane milling. Grinding tools.

2. *Suggested Jobs*

Ball-peen hammer; riveting hammer (iron or wood handle); screw driver (wood, iron, or aluminum handle); die holder; tap wrench; ferrule; clamps; lathe center; bench stops; nail set; center punch; marking gauge; soldering copper; bolts.

3. *Informational Material, Reference to Texts, Lesson Sheets, Catalogs, etc.*

Discussion and study of properties and characteristics of metals to be used, evolution of machines and machinery, present use of machinery in industry, safety practices and accidental prevention.

Reference material: *American Machinists' Handbook,* "Machine Tool Operations" (Burghardt, Parts I and II), job sheets, catalogs, and circulars.

4. *Outcomes or Degrees of Attainment*

The general purpose of this unit is to teach the pupils the fundamental operations and safety practices on power hack saws, drill presses, shapers, milling machines, grinders, and engine lathes.

Unit III. Forging and Heat Treatment

1. *Processes and Operations*

Heating metals. Forging cold-rolled steel. Forging tool steel. Flattening with hammer. Pointing with hammer. "Eye" forming. Bending. Shaping. Annealing tool steel, brass, and copper. Case-hardening cold-rolled steel. Spark testing for iron and steel. Judging hardening heat. Dipping or quenching work. Drawing the temper of tools.

2. *Suggested Jobs*

Coat hook; door knocker; scriber; desk lamp; book ends; bridge lamp; necktie holder; porch lamp; radio bench; fireplace set; scriber; punch; hammer; wrench; sign bracket.

3. *Informational Material, Reference to Texts, Lesson Sheets, Catalogs, etc.*

Discussion and study of the effect that heat has on metal, the necessity for various degrees of hardness of tools, the use of metal for various purposes, present methods of forging and heat treatment in industry, safety practices, and accident prevention.

Reference material: *American Machinists' Handbook,* "Forging" (Burghardt, Part I), job sheets, catalogs, and circulars.

4. *Outcomes or Degrees of Attainment*

The general purpose of this unit is to teach boys the principles of simple forging, heat treatment, properties and characteristics of metals, and how to operate a forge.

Unit IV. Molding and Melting of Metals

1. *Processes and Operations*

Melting of aluminum. Melting of lead. Making a sand mold. Making an iron mold. Pouring molten metal into a sand mold or an iron mold.

2. *Suggested Jobs*

Aluminum pattern; marking-gauge head; hack-saw handle; jackplane handle; screw-driver handle; name plate; Lincoln head; tray; emblem; book ends.

3. *Informational Material, Reference to Texts, Lesson Sheets, Catalogs, etc.*

Discussion and study of how to obtain liquid metal by heating, the melting point of metals, how hot the metal should be to produce a perfect casting, the necessity of vents in sand molds, present methods of molding and casting metals in industry, safety practices applying to melting and pouring of metals.

Reference material: *American Machinists' Handbook,* job sheets, catalogs, and circulars.

4. *Outcomes or Degrees of Attainment*

The general purpose of this unit is to teach boys (1) the purpose of a mold, (2) how to melt lead, babbitt, aluminum, and bronze, (3) how to pour metal into the mold safely.

General Woodwork for Intermediate Schools

The course in general woodwork is designed for eighth- or ninth-grade boys of the intermediate school. The time is one clock hour a day for twenty weeks.

Equipment	*Supplies*
10 Wood-turning lathes	Lumber: bass, birch, gum, poplar.
1 Hand jointer	Stains: paints, oils, shellac, and glue, including the usual assortment of brads, nails, screws, and sandpaper.
1 Small band saw	
1 Tool grinder	
25 Manual-Training benches	
1 Molding bench and bin	
Necessary hand tools	

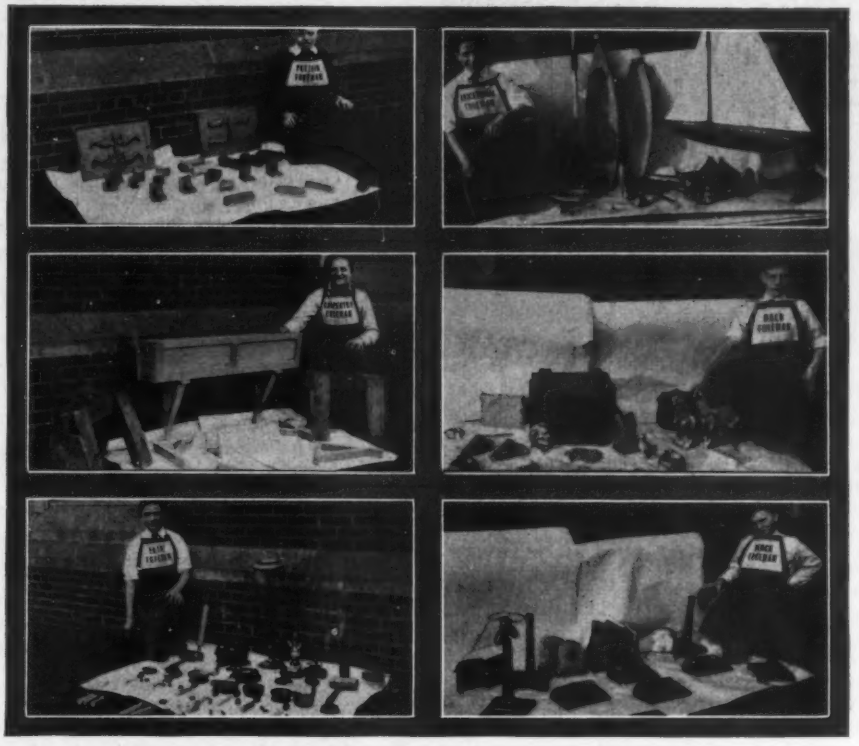
Organization of Subject Matter

The course is divided into five major units of subject matter, namely, (1) wood turning, (2) patternmaking, (3) molding, (4) benchwork in wood, (5) household carpentry, and (6) avocational construction. Equal emphasis should be given to these six units.

Each unit has a list of suggested jobs. All of these jobs cannot be attempted by all the pupils in each class. Therefore,

WHEN THE EMERGENCY ARISES, SHOE REPAIR BECOMES ONE OF THE HOUSEHOLD-MECHANICS WORK UNITS

the responsibility and privilege of selecting jobs, that is, articles to be made, are left with each individual shop teacher. It is felt that the teacher will thus be free to adjust the course to meet the needs and interests of individual students in each community. The students also have the privilege of a choice of projects within certain limitations determined by the teacher and by abilities demonstrated.



THE UNITS OF STUDY IN THE GENERAL WOODWORKING COURSES ARE AS FOLLOWS, READING LEFT FROM TOP TO BOTTOM: (1) PATTERNMAKING, (2) CARPENTRY, (3) WOOD TURNING; READING RIGHT FROM TOP TO BOTTOM: (4) AVOCATIONAL, (5) MOLDING, AND (6) BENCHWORK IN WOOD

As far as possible, articles that are useful should be selected. Mere exercises, as such, do not fulfill the requirements of the intermediate school. The problems suggested indicate the types which have been found practical by many successful teachers of general woodwork. Articles of use to the school organization are preferred.

The processes and operations listed with each unit represent the activities in which a student should develop some skill and understanding. The ability to perform these activities must be measured with due regard for the limitations of an eighth- or ninth-grade boy.

Unit I. Wood Turning

1. *Processes and Operations*

Centering stock for spindle turning. Spindle turning (straight cylinder, facing). Turning a convex cut. Turning a concave cut. Preparing stock for faceplate turning. Forming with a square-nose scraping tool. Forming with a round-nose scraping tool. Boring with the use of a lathe chuck. Turning to a template. Sanding in a lathe. Cup chucking. Pin chucking. Arbor turning. French polishing. "Touching up" lathe tools. Practicing safety.

2. *Suggested Jobs*

Parts for toys (cylinders, concave, convex, V cuts); file handles; chisel handles; screw-driver handles; stocking darners; wheels; trays; mallets; candlesticks; lamps; potato mashers; bowls.

3. *Demonstrations and Discussions*

New tools and processes; history of the lathe, its development and its present place in industry; study and discussion of safety practices in turning; study of parts of lathe, nomenclature, speeds, care and use.

4. *Reference Material and Other Aids*

Principles of Woodworking, Hjorth, pages 140–165, and 60, 62, 63; *Art and Education in Wood Turning,* Klenke, pages 14–29; *Wood Pattern Making,* McCaslin, pages 166–175; *Wood Work for Secondary Schools,* Griffith, pages 185–214; *Problems in Artistic Wood Turning,* Ensinger, pages 20–56; Job sheets prepared by instructor — supplements to demonstrations. Sketches and photographs of fundamental tool operations. Blue prints and working drawings. Models of all jobs. Posters on Safety Practices regarding wood turning.

Knowledge of the operation of a wood-turning lathe and ability in the use of spindle and faceplate turning tools in the fundamental operations of wood turning.

Unit II. Patternmaking

1. *Processes and Operations*

Drawing a pattern layout involving shrinkage, finish, and draft. Applying draft to a pattern. Applying fillet to a pattern. Preparing the parting for a split pattern — bench or lathe. Making and fitting dowel pins. Flange construction. Making core prints. Finishing a pattern with shellac. Shellacking core prints and core shapes. Constructing a half or whole core box. Making a simple pattern. Constructing a split pattern. Making a pattern with a core.

2. *Suggested Jobs*

Parallel-block patterns; split patterns for bronze bushing; split patterns for pedestal, building washers, clamp patterns.

3. *Demonstrations and Discussions*

New tools and processes; study and discussion of patternmaking as a trade and its relationship to other trades and of materials used in patternmaking; types of constructions and their purposes.

4. *Reference Material and Other Aids*

Principles of Woodworking, Hjorth, pages 223–249; *Wood Pattern Making,* Hanley, pages 13–15, 23–31, 47–125; *Wood Pattern Making,* McCaslin, pages 35–111; *Wood Pattern Making,* Purfield, pages 72–115; *Woodwork for Secondary Schools,* Griffith, pages

THESE PUPILS ARE PROUD TO WORK IN A CLEAN, ORDERLY AUTO SHOP

320–357. Models of all jobs. Blue prints and working drawings. Job sheets prepared by the instructor to supplement demonstrations. Model displays of various types of patterns and core boxes.

5. *Outcome or Degree of Attainment*

Understanding of the significance of patternmaking in industry; of simple pattern principles; of various types of patterns and of their construction.

Unit III. Molding

1. *Processes and Operations*

Tempering molding sand. Ramming a green-sand mold. Venting a mold. Gating a mold. Removing a pattern from a mold. Preparing a mold for pouring. "Coping down" a mold. Molding a green-sand core. Molding a dry-sand core. Making and preparing a baked-sand core. Reënforcing mold segments. Pouring a mold. Preparing a parting with parting compound, using a swab.

2. *Suggested Jobs*

Molding of simple patterns, split patterns, patterns requiring "coping down," patterns with a green-sand core, patterns with a dry-sand core; plaster paris molds and casts. Whenever possible, molds are poured in lead or aluminum.

3. *Demonstrations and Discussions*

New tools and processes; presentation and discussion of molding in industry with automatic equipment, a picture of the foundry, the pouring of a "heat"; the cleaning of castings; an explanation regarding the making of castings seen about the shop.

4. *Reference Material and Other Aids*

Wood Pattern Making, Hanley, pages 31–41, 157–171; *Wood Pattern Making,* McCaslin, pages 39–41, 67–69, 82–83; *Woodwork for Secondary Schools,* Griffith, pages 32–357; *Foundry Work,* Stimpson-Gray-Grennan, pages 1–200; *Foundry Practice,* Boy Scouts of America (Merit Badge Pamphlet), pages 1–62. Photographs and sketches of molds and mold sections. Model displays of types of cores and patterns. Pictures of scenes in foundries. Process sheet prepared by instructor to supplement demonstrations. Castings (models) which were made in the shop.

5. *Outcome or Degree of Attainment*

Acquaintance with the method of molding and the place of molding and foundry practice in industry; ability to mold a simple pattern in soft metal.

Unit IV. Bench Woodwork

1. *Processes and Operations*

Squaring up a piece of stock. Planing with a jack plane. Planing with a block plane. Fastening with wood screws. Boring. Making a miter joint. Paring with a chisel. Coping. Chamfering and beveling. Gouging. Setting nails. Using a spokeshave. Gluing with use of hand screws or bar clamps. Preparing for finishing (scraping, puttying, sanding). Finishing (painting, staining, filling, shellacking, varnishing, waxing).

2. *Suggested Jobs*

Book ends; table lamps; desk sets (pen, pencil, and ink set); wall cabinets or shelves; boxes; magazine carriers; skate-honing blocks.

3. *Demonstrations and Discussions*

New tools and processes; bench woodwork as related to cabinetmaking; study and discussion of woodworking trades with reference to types of constructions; study of kinds and sizes of materials used in projects to be made; a study of woodworking joints commonly used.

4. *Reference Material and Other Aids*

Principles of Woodworking, Hjorth, pages 27–53, 55, 70, 71, 79–82, 94–102, 119, and 120; *Handwork in Wood,* Noyes, pages 50–222; *Prevocational and Industrial Arts,* Wood, pages 3–57, 92–157; *Woodwork for Secondary Schools,* Griffith, pages 239–319, 24–75, 152–185; *Woodworking,* Wheeler, pages 26–33, 39–45, 58–63, 75–85, 87–89, 101, 102, 107, 112–116, 153. Blue prints and working drawings. Job sheets prepared by instructor to supplement demonstrations. Models of all jobs. Stanley Charts, Nos. 100, 101, 104, 108, 109, 111–120, 122 (Stanley Rule and Level Plant, New Britain, Conn.). Screw Chart (American Screw Company). *How to Know the Size of an Auger Bit* (Irwin Auger Bit Company, Wilmington, Ohio).

Unit V. Household Carpentry

1. *Processes and Operations*

Crosscut sawing. Ripping. Jointing long edges. Laying out angles with use of framing square. Bracing. Nailing (staggering, clinching, and toenailing). Simple assembly. Using a chalk line. Plumbing and leveling.

2. *Suggested Jobs*

Sawhorses (small, to be used in blocking up cars); wall brackets; flower boxes; step stools; miter boxes; lattices for garden.

3. *Demonstrations and Discussions*

Presentation and study of tools and materials used in carpentry, and the application of the projects to the home; an explanation of building-construction types, with special attention to names and terms distinctive to the trade.

4. *Reference Material and Other Aids*

Woodwork for Secondary Schools, Griffith, pages 11–71; *Carpentry,* Griffith, pages 13–141; *Principles of Woodworking,* Hjorth, pages 3–6, 223–249; *Carpentry,* Boy Scouts of America (Merit Badge Pamphlet) pages 1–17; *Woodworking,* Wheeler, pages 11, 22–24, 45, 52, 65, 73, 89, 97, 133–141, 340–352. Job sheets prepared by instructor to supplement demonstrations. Models of all jobs. Blue prints and working drawings. Stanley Charts. Nail Chart (American Steel and Wire Company, Cleveland, Ohio).

5. *Outcome or Degree of Attainment*

Acquaintance with tools and materials used in simple carpentry; a knowledge of building-construction terms; and ability to construct simple projects.

Unit VI. Avocational Construction

1. *Processes and Operations*

Application of processes and operations of previous units.

2. *Suggested Jobs*

Model boats; flying model airplanes; scale model airplanes; bows and arrows; bird houses; toys. Only one, or possibly two, types of construction to be carried on at one time.

3. *Demonstrations and Discussions*

Significance of having an interesting hobby; principles of construction of boats, model airplanes, etc.

4. *Reference Material and Other Aids*

Model Boat Building, Cavileer, pages 10–72; *Miniature Boat Building,* Leitch, pages 1–187; *A Problem in Boat Making,* Bealer, pages 6–21; *Beginning to Fly,* Hamburg; *American Boy Magazine,* full-sized drawings and plans of the A.M.L.A. (Airplane Model League of America); *Bird House Architecture,* Baxter; *Hand Craft Bird Houses,* Solar, Book I; *Bows and Arrows,* Decker; *Bows and Arrows,* Duff; *Archery,* Boy Scouts of America (Merit Badge Pamphlet).

5. *Outcome or Degree of Attainment*

A keen interest in some hobby; ability to perform certain tool operations, and a knowledge of the principles of construction involved.

Elements of Response to Federal Stimulus in Vocational Education

*J. V. Lynn**

(Concluded from June)

The Vocational-Teacher Problem

AN interesting fact appears in the rate of increment of industrial teachers. The day trade rate falls in comparison with the rate of student enrollment, while the rate for evening-school teachers rises in harmony with the rate of student expansion. There is a 3-fold growth of day teachers against a 4-fold growth of students, whereas in the evening schools the teacher growth is 4-fold against 3½-fold in students. This is directly the outcome of standardization in the former work, and multiplicity of service in the latter. Where a few recognized craft lines can be offered on the all-day-for-a-year-or-two plan the instruction can be offered to larger groups of students per teacher. Subject content is well developed and the mechanism of guidance, selection, enrollment, placement and follow-up has been perfected. It fits into the educational organization as a going element, and can be subjected to the administrative criterion of student-hour cost.

Not so is the evening school. Its organization is loose and sensitive to demand. It exists for unique service. The pupil-hour cost is not a factor in its administration in the same sense that it is in the day school. If a half-dozen workers appear with a request for instruction related to their occupations as kettle tenders at the gypsum mill, the evening-school director responds at once by hiring the mill chemist as a suitable instructor, and the unit is added to the organization until it has satisfied the demand. It was literally a ship that passed in the night, and hence typical of the evening-school organization. We can readily see that as the service functions more fully it must do so by greater teaching staff in proportion to students.

The selection of vocational teachers is a question that has not yet become unified among school administrators. On the one side we have superintendents who control the policy for their evening-school directors by using members of the regular staff to teach applied mathematics, drawing, and science to both day pupils and evening adults, and who require shop classes to be taught by industrial-arts teachers who have had several years of normal-school training, but little or no experience at the trade. On the other side we have superintendents who give the vocational-director authority to hire the occupationally competent man and put him at work teaching those who aspire to competency. The arguments pro and con are of interest because they have merit on both sides. On the side of the superintendent who is jealous of the standards of his profession the following support may be posited:

1. Teaching is a profession with its specific technique, which must be learned and used in order to succeed at it.
2. The subject matter is elementary or fundamental in the particular trade, and hence secondary in importance to the technique of instruction.
3. Vocational teachers are a part of the staff, and should take their place in all activities on a par with academic teachers.
4. The use of the same laboratory equipment by several instructors leads to confusion, hence day teachers should be in charge of evening classes also.
5. The effect upon day teachers of being in contact with adults is to add experience which is invaluable to those teachers in making vital interpretations of life to day pupils.

In contradistinction the pragmatic superintendent will say:

1. There is nothing mysterious in professional method. It is common sense easily acquired. General method is not required, and special method can be injected by a supervisory shot-in-the-arm as teaching proceeds. At most a special professional-training course of 150 clock hours is all that is needed.
2. The subject content is *sine qua non*. It ranges from the rudimental for boys in day schools to advanced technique and technology for adults in evening schools. The vocational teacher must be a master in order to command respect in the occupation.
3. It is admitted that vocational day-school teachers housed in the cosmopolitan building are part of the staff, and unity dictates the wisdom of assuming common activity. It is equally true, however, that the majority of evening-school teachers are employed in industry through the day. They never see the day school in action. They have no faculty demands, and teach no day pupils.
4. Laboratory work for the machine- and hand-tool type of adults is possible in the evening under an imported teacher because all are familiar with toolroom procedure in industry. Laboratory work in applied physics and chemistry can be taught by the day-school teacher provided he has vision and initiative to change objectives and methods. If not, the difficulties of duplex use of laboratory are of less importance than the benefits to be derived from vitalization. But again the sobriety of matured purpose removes trouble.
5. The value of experience in teaching adults for the teacher of day-school adolescents is admitted, but the countereffect is so much more frequently seen that a negative judgment must rule. It is so difficult for the teacher, after a day with adolescents and the subject matter and methods suitable to youthful reaction, to take on at its close new content, method, and objective characteristic of the adult approach. Only a few can successfully overcome it.
6. There is a species of fear, self-depreciation, and sensitiveness to lack of schooling on the part of workers in the presence of professional teachers. Should the teacher be a technical engineer in the employ of some concern, and known by sight around the plant, there will be confidence and ease of mind from the outset. The direct, empirical method of

*Trade and Industrial Teacher Trainer, Iowa State College, Ames, Iowa.

instruction used in the shops everywhere, comes naturally into play "up at the school," so that there is no lost motion through "distance."

Familiarity with the problem of meeting and helping occupationally competent men while teaching in evening classroom and laboratory, and pursuing with them special 150-hour training courses, has convinced the writer that to bring both class and teacher out of industry into the schoolroom is on the whole a better procedure for effective returns.

The corollary to selection is training. It has been touched upon incidentally in the previous discussion, but because of its importance it deserves more consideration. As a point of departure we have the established curriculum for training industrial-arts teachers, consisting of a long preëmployment normal or college course in shopwork and related sciences, with a required amount of education and psychology, and a rounding out of liberal arts. Industrial arts belong to the field of a general education, having some half-dozen valid objectives, chief among them being appreciations and guidance. A baccalaureate preparation for teaching this work is fully established. To insist that this should be superimposed upon a journeyman mechanic's training, or that there be a similar preparation in reversed sequence, is to demand what very few will meet. And since we must have the occupational competence, it follows that professional training must be reduced to the point of acquiescence. An intensive course of from 100 to 200 clock hours, followed by real supervision while teaching, is proving an adequate preparation for the vocational objective in education.

There is a fundamental difference between the philosophies of industrial teacher training and of agricultural teacher training. Agricultural education is not a training in skills. They are acquired on the farm by absorption, since they are never intricate. The schooling for farm life is, instead, technical, theoretical, economic, managerial, because excellence in these things is not found on the majority of farms. The amplitude of an agricultural science is made to flow into the partial void in the agriculture-education complex through a long preëmployment teacher-training course.

In the trades and industries, skill is the first consideration. No supervision and management is possible without an intimate experience of years' duration with the tools. Engineering curriculums of the mechanical and industrial stripe, with their limited shop-acquaintance courses, cannot pour their product directly into supervisory and managerial positions. They must have several years of probationary apprenticeship at production before admission to management. Now we have no schools where persons can be trained as teachers of the skills to the degree required. We must therefore bring them out of industry and give them the professional part of the trade-education complex.

The expansion in industrial teacher training, as shown in Table I, reflects the change in philosophy from use of an industrial-arts teacher to the use of craftsman teacher. In 1919 the designation of a teacher-training institution was universally adopted. These have in most cases continued to do the resident training work, so the increase of "agencies" from 68 to 91 means in most instances the addition of itinerant staffs working directly out of the office of state boards for vocational education. In some instances the institutions could and did establish extension services in order to reach the local craftsmen, but these would not count as added agencies. Wisconsin and New York states tried scholarships large enough to bring men into institutions for a one-year resident course. Wisconsin did not repeat the experiment. The system was beyond the range of acquiescence.

The small increase in teacher-training staff means in essence that the institutions have ceased to enter their industrial-arts staffs as vocational teacher trainers, and now seek reimbursement for only *bona fide* extension summer-school resident courses. This response has been due to a considered, deliberate pressure upon the institutions for a more correct alignment with best vocational ideals.

Some Generalizations

Through this brief sketch the writer has sought to lay the background for a general interpretation of the function of the national vocational education act in American education. The Smith-Hughes Law provides precisely for voluntary acceptance by the states of federal funds to develop new programs of vocational education. Federal penetration of the autonomous right of the state is only possible through voluntary acceptance and coöperation, and the right to inspect is entailed only insofar as it checks on value received. This does violence to no organization, and is mutually productive of good. The fact that 48 states accepted the terms shows no serious objection to the principles.

Indeed popular acceptance goes further. It seeks a more extensive equalization. The American Vocational Association, as the mouthpiece of all interests in the betterment of American schools is sponsoring extensions of federal aid. There have been several amendments to the original act. Hitherto there has been no aid for business and commercial education except studies and investigations by the Federal Board. There is a bill before Congress to extend aid to commercial evening, part-time, and full-time schools, and to augment funds for industrial short courses which do not aggregate 144 hours, which is the minimum length of term in the original act. This is an important extension in industrial education because it admits to the benefits of the act all types of convention schools conducted by college extension services either on or off the campus.

Thus in a brief space of fifteen years we have seen the vast school organization accept and gradually absorb into its economy a more complete preparation for life as its contribution to democratic culture. Vocational education, if it is to serve the needs of society on any adequate scale, must be brought into such rela-

tionship with the other objectives of a more inclusive education as shall give it no more emphasis than it deserves, but at the same time render to it all that it needs. With the complexity of modern civilization, and the philosophy of parallelism making its demand upon school policies, it is not so easy to determine just how closely the correct emphasis can be defined. Neither can the precise form in which vocational education can best be given be prescribed. There are trends, however, as shown in the previous discussion, which indicate that a satisfying procedure will be one which breaks the bounds of conventional, four-wall isolation, and invites the productive and business institutions to share with education in the responsibility of vocational preparation. The beneficiaries should have a direct, joint interest in any program.

My prediction is that there will be an elaborate extension of the part-time type of vocational training for everyone connected with commerce and industry in the junior capacities as far as the eighteenth year. The schools will be equipped to give all during that period an appreciative preparation for their social and civic duties, and also an intimate knowledge of the technical requirements of their work, leaving the manipulative skills to be acquired in vocation but under the supervision of a coördinator who will be paid from school funds to visit employees and secure from executives, directly, suggestions for school procedure in training for specific employments.

From the eighteenth year onward the supplementary training in school will occur only at points of change in individual employment, and will be either intensive short-course (full time for one or several weeks as required), or evening-school type. This amounts to a prediction that every school system of importance will have what is now called an opportunity school, but should be more truly designated an occupational school. It will be open all the year round, during the day and evening, six days a week and eight hours a day. There will be little class instruction, but registrations will be made and instruction completed as individuals come and go.

There will still be a need for full-time, regularly organized, preëmployment courses for the more skilled trades in the schools for those who know what they want and are ready to devote the time to it. They will not, however, have the significance or social-service value of the occupational school.

Hygiene of Vision in the School Drafting Room

*A. K. Rigast**

(Continued from June)

NORTH light, on the other hand, is the least fluctuating both in intensity and in color. It has an enormous volume of light of not very high intensity — from two to three candle power. Then too, it is not subject to rapid changes in intensity; it is well diffused, and it illuminates an object from all sides with equal intensity, reducing shadows to a minimum. In brief, north light allows a maximum of sharpness with a minimum of eye fatigue, as the eyes do not tire readily under these conditions, but maintain their efficiency for a long period of time. "Cold" north light, therefore, is ideal. It is an absolute necessity if eyestrain, with its attendant impairment of the student's health and efficiency, is to be avoided.

Besides the quality and quantity of daylight, there are other specific factors which must be taken into consideration in order to provide the best daylighting.

Unilateral System. Most experts on school lighting advocate unilateral daylighting; that is, the windows should be placed on one side only. This method of fenestration is recommended where the classroom is not more than 24 feet wide, or twice the distance of the window tops from the floor. It is a generally accepted principle that cross lights in a classroom should be avoided, if possible, on account of the shadows thrown on the work.

The light should always come from the left and at a slight angle from the front of the drafting tables in order to eliminate the faint shadows which otherwise would be thrown by the working edge of the square. This angle may be secured by placing the drafting tables so that part of the table extends about a foot beyond the back of the desks. Light coming in through this part of the window will, without falling into the eyes of the student, illuminate the working edge of the T square and thus eliminate the shadows from it. The drawing tables should never be placed farther away from the windows than twice the distance of the window top from the floor. If they were placed farther away than this distance, insufficient lighting would be the result, with its attendant eyestrain and eye fatigue.

Windows. The upper part of the window is very much more effective in lighting the interior of the drafting room than the lower part, hence the top of the glass should be as close to the ceiling as possible, never less than six inches below the ceiling line. The windows should be as wide as possible with narrow mullions

*High School, Sacramento, California.

between them. The window-glass area should be at least 20 per cent of the floor area, or a 1-to-5 ratio (see Fig. 4).

Window Shades. From a hygienic standpoint, it is desirable to have direct sunlight in the classroom. For obvious reasons, however, it must be excluded or diffused by means of window shades.

The functional purpose of window shades is (1) to diffuse direct sunlight, (2) to control illumination in order to secure uniformity in intensity, (3) to eliminate glare caused by bright skies outdoors, and (4) to eliminate glare from blackboards and glossy school furniture.

Window shades may be arranged in different ways in order to meet these requirements: (1) In place of the customary one shade operating from the top down, two shades may be used operating on two rollers, which are fastened at the middle of the window. One of these shades operates upward, the other downward; or (2) one roller may be attached at the bottom of the window, the other at the middle, both shades working upward; or (3) one roller may be fastened at the bottom, the other at the top, both shades unrolling toward the middle of the window.

In all cases the upper shade should be of very translucent material because the upper part of the window supplies the most illumination to the tables farthest away from the windows. Light which comes through the lowest portion of the window goes to the floor and is lost. For obvious reasons the upper shade should not be pulled down more than is absolutely necessary. The shades of the lower part of the window should also be sufficiently translucent to transmit as large a portion of light as possible into the room and to diffuse it at the same time.

Then too, the shades should not only cover the window openings, but they must be wide enough to cover the window casings to prevent direct light from passing their edges.

The color of the shade must harmonize with the interior decorations of the room, and it must, at the same time, meet the visual requirements. Light tan, light buff, or a neutral tint of yellow or green are, in general, very satisfactory.

Window shades play an important part in school illumination. Any lighting can be perverted by unwise handling of the shades. It is seldom necessary to draw all shades at the same time. The teacher should study the best arrangement of the shades for each hour of the day, and then adjust them according to his best judgment.

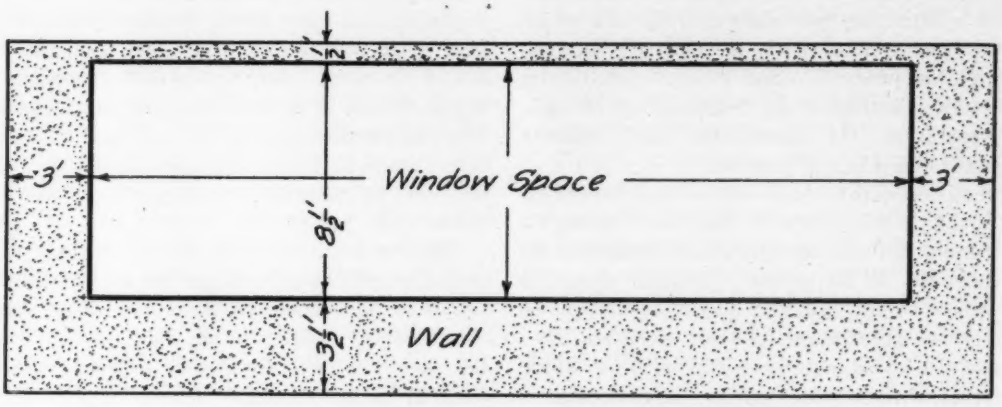


Fig. 4 Diagrammatic Illustration Of Window Spacing

Window Paint. Besides window shades, there are other means which effectively break up and diffuse the rays of direct sunlight without any appreciable loss of illumination. One of these is window paint. There is on the market a specially prepared white paint which can be readily applied to the glass. This paint is not materially affected by moisture, once it is thoroughly dry. In time, however, it will begin to crack and peel, and repainting will be necessary, which, however, can be done quickly and economically, thus maintaining the effectiveness of this means of diffusing sunlight for an indefinite period.

Window Glass. Whenever possible, frosted, ribbed, or pebbled glass should be used. Unquestionably these are the best means. They diffuse and transmit a large portion of the light into the room; the intensity is uniform, and the light is equally distributed throughout the room. Their use eliminates window paint, as well as the window shades and their manipulation.

Lighting Values of Tinted or Painted Walls and Ceiling. It is a recognized fact that the walls and ceiling play an important part in the distribution of light to the working surface. The rôle they play depends to a large extent upon their reflection factor. What color, then, should the walls and the ceiling of the drafting room be painted or tinted? In the following table experts have given the reflection factor of the different colors. It should not be difficult to select the appropriate color.

Reflection Factor of Color

	Per Cent		*Per Cent*
White paper	84	Satin green	63
Ivory-white	77	Buff	60
Ivory	73	Silver-gray	51
Pearl-gray	73	Buff stone	47
Light gray	70	Ivory-tan	43
Lichen gray	69	Pale azure	37

In order to reflect as much light as possible from the ceiling upon the drawing and at the same time obtain a pleasing and cheerful effect, the ceiling should be painted or tinted either cream, ivory-white, or ivory color. Visual comfort requires that the reflection factor of the walls should not exceed 59 per cent. The appropriate color of the walls, therefore, is either ivory-tan, buff stone, medium grayish green, or pale azure.

In case the ceiling is higher than 12 feet, about a 2-foot wide frieze could be made with the ceiling color, thus greatly increasing the reflection area without decreasing the visual comfort.

Whenever oil paint is used, it should dry dull or mat, never glossy, as glare would inevitably result.

In selecting colors for the drafting room, the guiding principle should not only be the visual comfort, but also the psychological effect upon the pupil. It is a well-known fact that the effect of soft, warm colors is beneficial on cold, gray, dreary winter days. These colors raise the spirit of the student, increase his cheerfulness, and improve his attitude toward his work. What is desired of color is atmosphere, tone, feeling, and expression of repose.

Artificial Lighting

It cannot be too strongly emphasized that the school drafting room requires the best light whatever its source. The provision of artificial lighting which permits the easy distinction of fine lines, small details, and finely divided measuring scales is of prime importance. Drafting requires constant, active, and concentrated use of the eyes. The artificial lighting, therefore, should be of superior quality. The problem is to provide proper and sufficient light, not too much nor too little, as the one may be as harmful as the other. If the light is inadequate or improper, the work must be held too close to the eyes. This results in strain of the eye muscles, which in turn may cause eye fatigue. Under proper lighting conditions the eyes are not fatigued any more than is the body under proper working conditions.

Furthermore, the illumination intensities may be adequate, but the lighting may be improper. The light source may be too glaring, shadows may be too strong, and the direction of the light may be unsatisfactory. All these factors may materially reduce visibility and thus produce visual discomfort.

On the other hand, effective lighting permits one not only to see and to act with greater speed, certainty, and comfort, but it also increases efficiency because errors and spoilage of material are reduced. It also improves discipline because properly controlled lighting is stimulating, thus favorably affecting the student's attitude toward his work as well as toward his surroundings.

Recently an experiment was made to determine the relation of artificial lighting to production. The original lighting system was unsatisfactory: the lamps were bare, intensity low, and diffusion poor. In this experiment, which lasted for a period of 15 months, the illumination intensities were increased 25 times, the light was properly diffused and redirected. The results which are given below are startling as well as instructive:

Increase of Illumination In Foot-Candles	*Per Cent Increase In Production*
1.2	0
6.5	13
9.0	17
14.0	25

Although this experiment was carried out in an industrial plant, the results obtained there may well be applied to a school situation because lighting conditions affect man equally wherever he may be.

In the last analysis, therefore, efficiency of lighting involves efficiency of vision, provision for eye comfort, and conservation of visual energy.

Systems of Artificial Lighting

Let us now proceed to the discussion of artificial lighting in detail. Artificial lighting may be classified in three groups: the direct, the semidirect, and the totally indirect.

Direct Lighting. Under this system the light is received directly from the luminaire. The lighting may be local, that is, placed either close to the work, or above it; or it may be general, i.e., the lights are placed overhead, thus illuminating the whole room. The luminaire may be open-bottom, inclosed, or semi-inclosed. The open-bottom luminaire is very extensively used in shops, and even in some school drafting rooms.

It is at once apparent that the direct-lighting system does not meet modern school-drafting-room requirements. It produces harsh shadows as well as glare, which is due to the reflection of the light sources from textbooks, polished or glossy desk tops, and shining paper. Due to poor diffusion of light, the whole atmosphere of the room appears cold, depressing, cheerless, and prisonlike.

The advantages of this system are (1) its economy of operation, and (2) its relatively high efficiency.

(To be concluded)

ADULT EDUCATION

The great thing for the workingman today is a steady job. The laboring man today needs to attend evening school to hold a steady job. Improvement in the trade adds to a worker's self-confidence, and he becomes a happier and a more competent worker. — *I. B. Morgan.*

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. METZ, Editor

WHAT SHALL WE DO NEXT WINTER?

Although schools in most sections of our country have just closed or are about to close, it is, nevertheless, time to look ahead and plan for what is to be done during the next year.

Mr. George Melcher, superintendent of the schools of Kansas City, Mo., tried to solve the unemployment problem in his city during the past school year by inducing many young workers to return to school. For this purpose he sent out the following letter and got very good results:

"To Young Men and Young Women of Kansas City:

"The public schools of Kansas City, Missouri, are making ample provision for the education and training of all persons over five years of age and under twenty years of age. These provisions are in the regular elementary schools, junior high schools, senior high schools, continuation schools, evening schools, trade schools and colleges. In these schools more than two hundred different courses are now conducted so that a student may have a wide range of selection. Additional worth-while courses not now offered will be organized in any of these schools when demanded by a group of fifteen or more.

"No young person in Kansas City need remain out of school because of lack of school facilities nor does he need to remain out of school for lack of proper clothing as the Mutual Help Center is prepared to furnish adequate clothing to every school pupil in the city. When a pupil is unable to provide books these will be provided by the Board of Education. The Gold Star Scholarship Fund aids worthy young women and young men who are making a good record in school but who are financially handicapped. No city is making more adequate provision for the education and the welfare of all of its young people than is Kansas City. No other city has as large a percentage of the youth from fourteen to twenty years of age in school as does Kansas City. Yet, in this city, there is a considerable number of young men and women who are not in school. Many of these young persons are employed. This is right. Doubtless many persons from sixteen to twenty years of age should be employed in industry. Many young persons of this age are not in school and are not employed in industry. Unfortunately these young persons usually are forming habits of idleness and loafing, and are acquiring wrong attitudes toward life and toward society and in some cases forming antisocial and immoral habits.

"There is not a valid reason why any young person under twenty years of age in Kansas City who is not employed should not be in school. If he does not enjoy the regular school classes he has *splendid opportunity in continuation classes,* evening classes, and special classes offering an almost endless variety of courses. All good citizens should realize that the opportunities are here. They need only to be seized upon by the young people."

The progressive attitude taken by Kansas City and some other cities as well, in thus throwing open educational opportunities to the unemployed, provides an admirable way of combating antisocial tendencies.

Even though the increase of work brought about by this sort of emergency measure would probably have to be taken care of by a reduced force of teachers or by teachers working at a decreased salary, nevertheless, the great amount of civic good accomplished by this method wherever it has been employed comments it to the educational leaders in cities where it has not as yet been tried. For those on whom devolves the task of deciding what the schools are to do next year, Mr. Melcher's letter contains more than a worth-while thought. Incidentally, for those superintendents or board members who voted on the curtailment of school-shop instruction because it is "merely an educational fad" — it was mainly the shop courses and the commercial work which was most often chosen by the young workers who returned to school in order to profitably employ themselves during this period of enforced industrial idleness.

THE SCHOOL AND GENIUS

Almost a hundred years ago, Samuel F. B. Morse conceived the idea of the telegraph. It was not until 1844, however, that the message "What Hath God Wrought!" was flashed across the first telegraph line established between Washington and Baltimore. How many high hopes, disappointments, heartaches, periods of anxiety and exultation went into that first, comparatively short stretch of wire, can hardly be imagined. To an intrepid, fearless delver in many things such as Morse, obstacles, however, were but incidents that had to be surmounted, and surmount them he did, although many of them sorely tried his mettle.

Morse was graduated from Yale after which he studied art both in this country and in England. He became well known as a portrait and historical painter. He was probably the first man who gave art lectures in America and he held the position of president of the National Academy of Design for years.

Art, however, did not occupy all of his time, for he is known as the inventor of a force pump and a marble-cutting machine, besides being the inventor of the telegraph.

The invention of the telegraph was epoch-making, and the single experimental line between Washington and Baltimore quickly expanded so that within two years 1,300 miles of telegraph wires were constructed in America alone. Before many years the entire nation was closely knit together by a veritable net of telegraph lines. With the laying of the Atlantic and other ocean cables, continents suddenly became neighbors who could communicate with each other with ease.

What enabled Morse to contrive so momentous an innovation? Of course, everyone will concede that he was an exceptional man — a genius. His brilliant mind, however, would have helped him little in devising the telegraph had he not remembered that his science teacher, Prof. Jeremiah Day, had one day said in class that if "the electric fluid passed through a chain in a dark room the fluid would be visible through the links, and that if a circuit were interrupted by several folds of paper a perforation would be made."

Youngsters of today have infinitely more opportunity to learn at first hand scientific facts coupled with information about materials and tools than did the student of Morse's day. It is difficult to say just what part the modern school shop has had in the tremendous advances made in late years in the realms of science and invention.

Not every person is able to apply the general information contained in purely academic courses. It is only by specific applications, a learning by doing, that will enable a large portion of human beings to apply the general to the particular. Industrial arts and vocational education are particularly strong in teaching many of the worth-while lessons that function in everyday life. This should be remembered especially in these times of retrenchment when so many misguided efforts are made to rob the young of the valuable assistance given by the shop courses. It is a great pity that the budget balancers can but see the one side of their problem, that of lopping off so many thousand dollars per year without carefully comparing the seeming temporary gain against the irreparable damage which the curtailment of some phases of education, such as industrial arts or vocational education, can bring about.

HOW TO MAKE SCHOOL VISITS

A certain principal who was very desirous of improving his school and his teachers, so arranged his schedules that he could assign his teachers to take a visiting day each week. He asked his teachers to take copious notes on their trips and to report their findings as soon as possible.

The first teacher went out and upon her return reported that she had visited every room in the school that had been assigned to her. She expressed astonishment that such poor teaching as she had witnessed could be done anywhere in the world. She said that she was simply aghast at what she had encountered.

The second teacher then made her visits to another school, and upon her return reported that it seemed to her the teachers in this school were merely looking upon their jobs as a money-getting proposition, and that the children under their care were getting no consideration at all. She expressed the opinion that their own school was so far ahead of the one she had visited that there was no comparison.

The third teacher then started out on her mission. Her report showed that she thought the time spent in making the visit might be reckoned a total loss. Practically everything she had observed was wrong, and as she put it, she was simply disgusted.

The principal, who had patiently listened to each one of these three reports, then called a teachers' meeting. In his address he remarked: "The purpose of my sending you out to visit other schools and other classrooms is to improve our own school and our own teaching. You, however, have made your visits supercritically, looking for shortcomings and things to be criticized. Now I want you to go out on all future visits and look for points of perfection that may be praised and emulated, and not to bother about looking for defects."

The teachers went out on their future school visits with a new viewpoint and they brought home enough new ideas which, when applied, made their school the best in the city.

Many industrial-arts teachers make their shop visits to other schools very much like those teachers who looked only for the things that deserved condemnation. The biblical saying, "Seek and ye shall find," applies today as it did at the time it was first uttered. If one looks for evil, the evil shall be seen, but likewise the good if one but searches for it.

This should be especially remembered today, when because of the necessity of retrenchment, periods may have to be shortened and classes increased. Nothing is gained by spending energy uselessly in resistance and opposition. It is much better to spend the time in trying to devise ways and means for doing the job that has been assigned or in learning how others have already done the job. When one has the opportunity to visit the shop of a teacher who is doing that which seems impossible, it is well to remember that nothing is gained by looking for shortcomings, but that it is far better to scrutinize the teacher's class organization and methods in order to discover that which makes the scheme function. Refinements in any system or method are scarcely ever the results of the first efforts, but rather the fruit of time and painstaking labor.

THAT NEW JOB

Many new teachers are confronted at this time with the serious task of securing their first teaching position. Anyone who has had the opportunity of glancing over applications for teaching positions must concede that a considerable number of the applicants seem never to have given thought to the subject of how to take care of this important item. Many of them neglect, for instance, to analyze themselves in order to definitely determine their weak as well as their strong points, and yet this is necessary because the success of the applicant often depends upon his own knowledge of what he can do and what he cannot do.

Some letters of application are prepared in such a slovenly manner that one wonders whether the applicant really wanted the position for which he was writing. Application blanks, too, are frequently made out in this careless fashion. Names and addresses written so that they are almost illegible, blanks left where information should have been recorded, statements made that seemingly contradict each other, all of which show that the applicant has not considered that his letter or the application blank which he is filling out is a piece of sales literature which is supposed to function in securing a coveted position.

These points are vital at all time — they are doubly so now — and they deserve consideration.

Back in the Nineties[1]

*Charles A. Bennett**

UNLESS I am very much mistaken, this occasion furnishes a new sensation for my colleagues of the nineties. Never before have we been set apart as Exhibit A for the rest of you to examine. I suppose we are to function today, either as models or as warnings. I know that some of us have suffered so many indignities from our academic friends in the past that to be set up as bad examples would be no new experience. But I wish to assure all such martyrs that I have known the instigator of this display for some time and I am aware of the fact that his great passion in life is scientific research. I am convinced in my own mind that whether it turns out that we are pointed to as models or as warnings, we will at least have the satisfaction of having contributed to the cause by our presence here today. Personally, I think we, as a group, should be considered a warning. For, if the present generation of teachers in the field of manual and industrial education does not do better at our age than we have done, they will be worse bad examples than we are.

[1]From an address at the Industrial-Arts Luncheon held at the American Vocational Association convention, Friday, December 11, 1931, at New York City. This luncheon meeting, under the chairmanship of Dr. William E. Warner, of the Ohio State University, Columbus, was held in honor of industrial-arts men who began teaching before 1900.

*Editor of the *Industrial Education Magazine*, Peoria, Illinois, by whose courtesy the address is herewith reprinted.

But my part in the program this afternoon is to recall a few of our experiences of the early days. I hope that what I shall say will be considered merely as a kind of caption and explanatory note to accompany Exhibit A.

The Beginning

The general aim of industrial education in the early eighties was much the same as the general aim of vocational education today. Some of you will remember what Dr. C. M. Woodward called "advanced ground as to the duty of the public schools" which was taken by Superintendent Wickersham of Pennsylvania when he said:

"It is high time that something should be done to enable our youth to learn trades, and to form industrious habits and a taste for work.

"It is not enough to instruct a boy in the branches of learning usually taught in our common schools, and there leave him. It must be seen to by some authority that he is allowed a change to prepare himself to earn a livelihood. It takes more than a mere knowledge of books to make a useful member of society and a good citizen. The present product of our schools seems to be, in too great a degree, clerks, bookkeepers, salesmen, agents, office seekers, and office holders. We must so modify our system of instruction as to send out instead

GUESTS OF HONOR

Reading from left to right:
Top Row: E. B. Kent, M. M. Proffitt, L. W. Wahlstrom, R. G. Weyh, W. T. Bawden, J. F. Barker, A. F. Rose, C. S. Van Deusen, A. L. Williston.
Center Row: F. M. Leavitt, G. M. Gaither, C. A. Kunou, A. W. Richards, Joseph Sandberg, J. C. Park, G. F. Hatch, R. W. Selvidge.
Bottom Row: C. B. Connelley, R. H. Smith, C. R. Richards, C. A. Bennett, David Snedden, E. S. Barney, W. E. Roberts.
An 11 by 14-in. photograph showing this group may be obtained from Dr. William E. Warner, price $1.50.

large classes of young people fitted for trades, for business, and *willing and able to work.*"[2]

This quotation has an up-to-date sound to the vocational-school worker of today. But conditions are very different now from what they were in the eighties. Then there was a firmly rooted conviction, born of generations of scholastic aristocracy and the apprenticeship system, that education did not include trade instruction, and that no funds for public education should be used for that purpose. It was then very generally assumed that any expense in connection with learning the processes of a manual occupation should be borne by the learner, his parents, or his employer; it should not come out of the public treasury. We old-timers recall how impossible it would have been to have suddenly forced trade teaching into the public schools. We recall the attitude of a score of educational leaders, including Dr. William T. Harris, an experienced and honored leader and one of the outstanding educational philosophers of that time.

What Manual Training Did for Vocational Training

The development of industrial education from that point to the extensive work of today, when millions of dollars are taken from the national treasury to pay for vocational education and many more millions from state and local treasuries, has been extraordinary. As we very well know, it came about through the application of that very old mechanical device of first inserting the thin end of a wedge. In this case that thin end was called manual training. The popularity of the manual training of the early days made possible the vocational education of today.

Concerning that wedge, it should be recalled that the Russians had shown us how to analyze a mechanical trade so that its elements were comparable to the teaching elements in language, science, and mathematics, and they had shown us how that, in one school, at least, they taught these elements successfully. Dr. Woodward, in Pestalozzian phraseology, spoke of these as the "alphabet of steps in mechanical science." In his announcement of the new "mechanical course," made October 1, 1877, which course developed later into the manual-training school, Dr. Woodward adopted another Russian idea, namely, "instruction before construction," which being interpreted, meant teaching the elements before allowing students to work on constructional or commercial jobs. In this way, he said, the arts (notice that he did not say trades) are made the direct subject of study and attention; "their subsequent combination (which may or may not follow in school experience) is a very simple matter." Thus he was disarming his educational opponents. Manual processes were to be taught as *arts*, not as trades — as accomplishments, as desirable skills, not as bread-and-butter occupations.

In this illuminating historic pamphlet we seem to see the very working of Dr. Woodward's mind. After another paragraph on the advantages of this procedure, he reaches the rather startling conclusion: "It is not proposed, therefore, to teach any special trade or calling, nor will any of the products of the shop have a marketable value." This is startling because it does not seem to follow logically from what went before. But it is easy to read between the lines. The engineering-school environment of Dr. Woodward, the success of the Russian method in Boston, Dr. Runkle's observation that such instruction might be good for all boys whether they were to be mechanics or not, and the prejudice against teaching trades at public expense made the adoption of a general industrial-school idea possible where a trade-school plan, as such, would have been impossible. So it was adopted in the manual-training school.

The manual-training school was immediately popular. Public-school authorities considered it safe as long as it claimed to teach no particular trade; and it was not long before the students of pedagogy whose attention had been called to the works of Rousseau, Pestalozzi, and Froebel began to adjust their theory to harmonize with this new and popular movement. And so the success of Dr. Woodward's school and his timely and convincing statements, followed by those of many other educators, and by the approval of manufacturers and other business and professional men, gave us our public manual-training high schools. These schools brought tools, machinery, and trade processes into public education, and their popularity made the next step to vocational education comparatively easy. And, it should be remembered, vocational education is the thick end of the same wedge. It is an expansion of that feared and looked-down-upon trade teaching of the earlier days.

Manual Training Succeeded by Sloyd Work

But the manual-training movement accomplished much more than to serve as the thin end of the wedge that brought in vocational education — much more than to provide manual-training high schools and similar schools by other names. Very early there was a demand for shopwork in the grammar grades of the elementary school. A few schools provided the necessary shops and equipment. Then came the problem of what to teach and how. The work was begun by teaching the same course to the grammar-grade pupils which was being taught in the high schools. That, however, was not satisfactory. I recall the glow of satisfaction that I experienced when I received from the Industrial Education Association of New York City the course of simplified joints and exercise pieces for the seventh and eighth grades. That course seemed to me, at that time, to be the solution of a most vital problem. But soon after that, there came to this country the Swedish sloyders who told us that we should make complete, useful articles, not mere joints—not even the "projects" of the third period of the Russian scheme, but things

[2]Report of U. S. Commissioner of Education, 1893–94, page 883.

useful in the home. (Parenthetically let me add that we old-timers know that the modern "project method" of teaching is found in its essentials in that now despised Russian system. And the present trade analysis is a further development of the analysis of the mechanic arts which was at the foundation of the Russian system.) The coming of the Swedish sloyd, especially the coming of Gustaf Larsson with his thorough grounding in sloyd principles and his desire to modify his course of models to suit American home and school conditions, led to a battle royal in Boston between the "sloyders" and what we sometimes called the "jointers." One incident of that battle has always been to me a source of much amusement:

I was visiting Benjamin F. Eddy in his shop at the North Bennet Street Industrial School. I knew him as a "jointer" with a good deal of originality, and a man who had come up through the trade and then gained an inspiration from the Russian methods as adopted at the School of Mechanic Arts in Boston. Inquiringly, I said to him, "I see you have changed to useful articles. How did this come about?" He replied, "This work is supported by a lady who has become interested in the sloyd and she wants me to have the boys make useful things." Then, in order to more fully explain his attitude, he added, "I had a chisel exercise in my course that was a good one and I didn't want to give it up. So I stuck a piece of sandpaper on it and called it a match scratcher. Then it was considered very satisfactory."

But the problems of the grammar-grade instruction were not all settled by advice from headquarters or by the compromise course worked out a little later for the city of Boston. The Russian scheme of teaching was an autocratic, rigid system. I need not mention that it originated under the rule of a czar. Under that system, an elementary course was a series of exercises that every student was required to do in the prescribed order. When thus applied, in military fashion, to the picked groups of students in American manual-training high schools, it seemed to work fairly well at first, though various and sundry devices were soon adopted to keep pupils together so that they could all begin each exercise, or joint, together. Among such devices were dismissing the rapid pupils as soon as they completed the given exercise, as in Philadelphia, or requiring the slow ones to do extra work on Saturday, as in Trenton, or giving the fast ones repairwork between the regular exercise pieces, as in Springfield. But in the grammar-grade shopwork, where the pupils were not selected, where classes were sometimes larger, and where the pupils worked in the shop only once a week, conditions often became chaotic. Something had to be done. The enemies of shopwork were ready and even anxious to point to its failure.

The Elements of the Problem

There were three vital elements in the problem: (1) The rigid course, which both the sloyders and the jointers inherited from foreign countries; (2) the demonstration and other class instruction which was regarded as essential by the jointers, even though it was followed by individual instruction when needed; and (3) the exclusive individual instruction insisted upon by the orthodox sloyders.

When compromise courses were adopted, the teaching problems were multiplied. To keep the pupils together in order to make the class instruction vital to each pupil in the class was still regarded as essential, yet it seemed to be impossible. Under the pressure of such difficulties, supplementary models or exercises were introduced between regular ones, for rapid pupils. Some teachers who adopted a compromise course made the exercises required work and the useful articles supplementary. If these latter were more interesting to the pupil than the exercise pieces, they served as a stimulus to effort or as a reward for speed in doing the exercise pieces.

About 1890 it dawned upon some of the progressive thinkers among the teachers that the rigid, identical course for every pupil was not the ideal course because no two pupils were alike. Instead of trying to adjust the pupils to our course, we should adjust the course to the pupils. We should not expect all pupils to learn exactly and only the same things and acquire just the same skills in a given course. Now it seems strange that we had not dropped that old military idea long before. On the other hand, we had the example constantly before us in the teaching of most academic subjects. The essentially individual character of handwork was what made the rigid military system break down when individual differences in speed, skill, and general capacity were taken into serious consideration.

Individual Differences

When it became clear that, instead of constantly struggling to get rid of those differences, we should accept them and plan our work accordingly, the whole problem of teaching manual training appeared in new form. We began to see it in two dimensions instead of in one. Instead of a course having merely elements of length, it might also have elements of breadth. Lengthwise the pupils might go forward together, essential step by essential step, fundamental operation by fundamental operation, yet breadthwise they might enrich that fundamental experience according to their individual capacities. Out of this idea developed the plan of arranging the manual-training course in groups of things to be made and facts to be learned, each group being intended to teach the use of certain fundamental tools or the application of certain principles or processes in construction, or both. In each group were easy and also more difficult things to make. From the pupil standpoint, there was a sufficient variety to satisfy individual tastes and capacities. From the teacher standpoint there was a variety from which to select to give the pupil the kind of experience he needed and was ready to undertake.

Under this plan of organizing the course of instruction, demonstration lessons were fewer in number, individual initiative was stimulated, and, while the teacher's problem of giving instruction was no less complex, it was more satisfying because he knew that he was doing more for the individual members. He was combining effectively the best in individual teaching with the best elements of class or mass instruction. And, what was more important, in the eyes of the school principal, he had an orderly, interested, busy class.

As soon as this new conception of a course of instruction as having two dimensions or as not being a rigid series of models or problems or projects came to be common, various means were employed to make courses more or less flexible. Some teachers, however, who ought to have known better, went so far as to have no organized course at all. Without knowing it, they swung their pendulum way back to the manual-labor days of the 1830's, but that is another story.

Today, with our insistence on taking into consideration the individual differences of pupils, it would seem that the rigid course of the old type is gone forever. The group idea has been expanded into the course made up of *units* which in many cases do not have to be given in any particular sequence or all of them to any one child. It would now seem that we of Exhibit A may rightfully claim that we are like St. Michael; we slew the dragon known as the rigid course. To that extent, we made the country safe for the present ideals. We cleared the way for industrial education, agricultural education, home-economics education, and art education, as well as manual- or industrial-arts education, to organize courses on the unit plan. The unit plan is hardly more than the group plan carried to a higher power.

Trail Blazers

Yet it must not be understood that we old fellows made all this advancement unaided. Just as you younger men are receiving help from the research specialist, the sociologist, and the child-welfare workers, so we looked to the educational leaders of our time for guidance and inspiration. We read Quick's *Educational Reformers* way back in the 90's; we profited by the vigorous attacks on our work by Colonel Francis W. Parker; and we listened to the brilliant, stimulating addresses of Dr. G. Stanley Hall. We were among the early readers of James's *Talks to Teachers* and a few of us owned well-worn copies of James's *Briefer Course in Psychology,* before the days of Thorndike's *Elements.* Then came John Dewey's *School and Society,* and almost immediately thereafter his incomparable series of articles in the *Elementary School Record.*

No, we deserve little praise for originality. Probably it would be no more than fair, however, to give us the credit of having been zealous workers in the cause of a broader, richer, more cultural, at the same time, more practical American education. We blazed a pioneer trail where you younger men are now constructing a paved highway for the youth of the future.

One-Tube Teachers

*Laurence Parker**

OUR good friend in a city near by is set in his ways and sometimes I think he takes a pride in it. When the rest of us graduated from crystal sets and head phones for the listening purposes, our friend showed his conservatism by buying a one-tube affair which would bring in only his local stations on his head phones. "No," he was "not interested in other broadcasts" and he knew that "better tone quality and programs couldn't be had on any other of the new-fangled sets." When he was persuaded to listen to the loud-speaker sets of his friends he complained for days of the "hubbub" that greeted his ears and "distressed him." "No, sir, the one-tube set is just the thing. Quiet and peaceful and I hear all I want," he would say.

His nephew brought home a "new-fangled set to try." The old man went to his room to escape, but strange new programs stole through the keyhole. Next evening he sat in the room with the new set, predicting it would soon get out of fix. He is now a fan for the most varied programs on the air.

We laughed at him for a long time, yet a lot of us act in just the same funny way. The training we got for "our career" was only a "one-tube" affair. It would do until we commenced to need to know what else was on the air, what others were doing and were discovering and broadcasting in conventions, in books, and in trade magazines.

But we stuck to our one-tube set which brought us the same old features we learned at school. If folks told us of new methods we were skeptical and said the old local program is good enough and gives me all I need. But let's change over from the one-tube attitude to that of a real up-to-date outfit that will bring in the whole country's activities. We will be surprised and confused at first at the many "new programs on the air" for us. We will find that conventions, visits to other school shops, trade books and trade magazines will open up a new world to us. After the first confusion of it all is over, and after we have gained the right attitude, we wouldn't go back to the old one-tube set and the local program for anything.

*Kansas State Teachers College, Pittsburg, Kansas.

PROBLEMS & PROJECTS

FREE-HAND, THIRD-ANGLE PROJECTION FOR BEGINNERS IN MECHANICAL DRAWING

Jonathan Bright, Academy High School, Erie, Pennsylvania

(Continued from April, see Supplement No. 246)

Problem Sheet No. 7

The problems on this sheet involve the laying out of center lines, and the drawing of straight lines tangent to arcs or circles. In some cases this involves the drawing of small arcs after the straight lines have been drawn; i.e., fillets and round corners. In most cases the arcs are drawn about a center and the straight lines drawn tangent to them. In two of the problems the radius of the arc is greater than one half the width of the object. Therefore the sides of the object do not come tangent with the arc but are intersected by it.

Problem Sheet No. 8

Problem Sheet No. 8 is very similar to No. 7, except that the straight sides of the objects are tangent to the cylindrical bosses. The surface of the bosses being higher than the surface of the object, the flat surface of the object meets the cylindrical surface of the boss at right angles. The intersection of these two surfaces extends from the point of tangency on the one side of the boss around the boss to the point of tangency on the other side. Drawing the view, on the plane parallel with the axis of the boss, will require an extension of the line representing this flat surface to a point in line with the point of tangency in the adjacent view. The instructor is expected to use his judgment in adding fillets and round corners where none are shown in the perspectives. One of the objects shown has lugs instead of bosses. This will probably be a new term to most of the students. The difference between a boss and a lug should be explained at this time.

THE MARIMBA

S. A. Woodbury, State Teachers College, Kearney, Nebraska

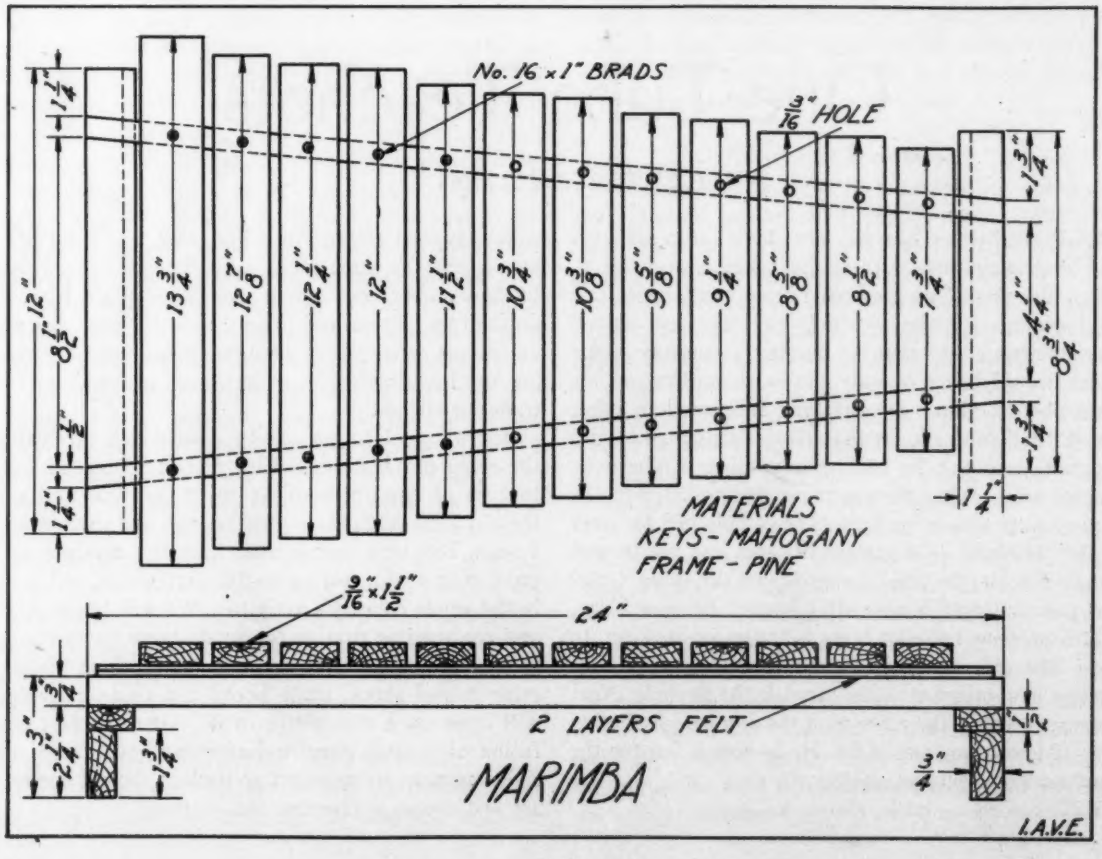
The marimba described herewith has been adopted for the sixth-grade shop at the State Teachers College Training School, Kearney, Nebr. The pieces required in the construction of this project are of such size that the sixth-grade pupils encounter no insurmountable difficulties in preparing them.

The arrangement of the parts has been experimented upon until the air cushion beneath the keys just about gives the maximum vibration of the keys so that the best tone will be obtained.

It also was found that the best results were obtained when the keys were made of mahogany. This wood seems to possess vibracussion qualities not found in any of our more common woods.

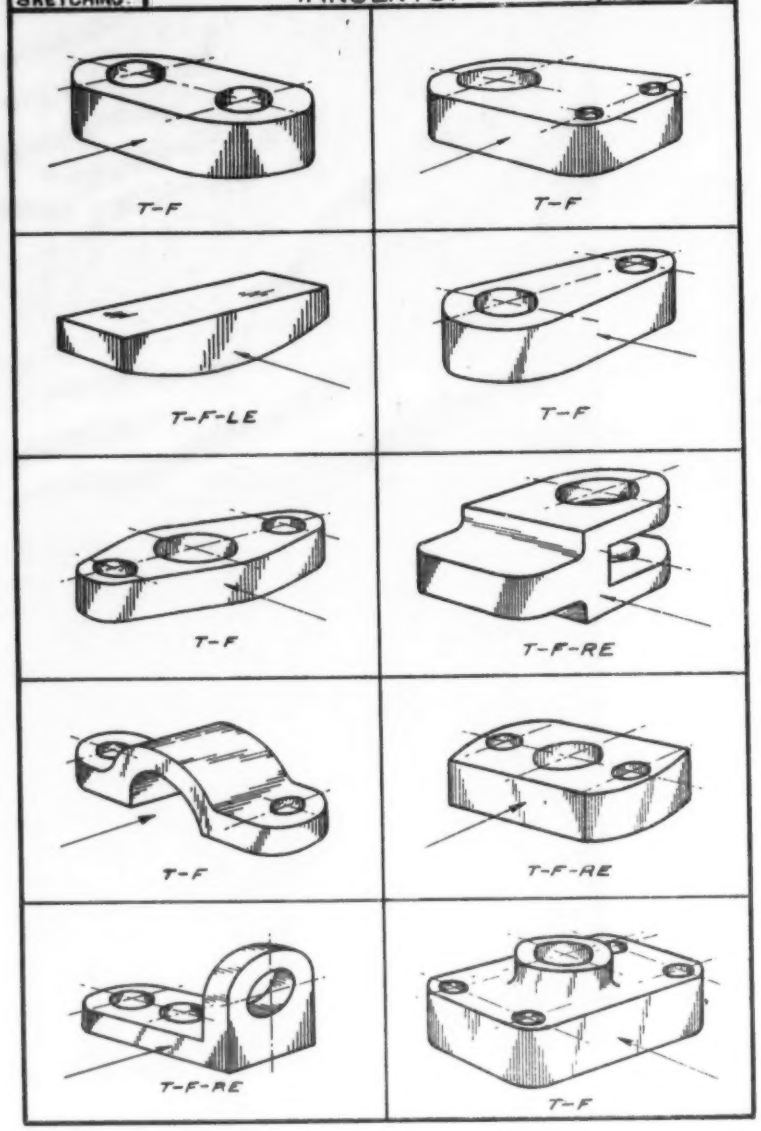
In tuning the keys, hollow out underneath to lower the pitch and cut off the end to raise the pitch. Merely making the key thinner will lower the pitch but by hollowing out in the center, underneath, produces the mellow tone of the commercial models.

By increasing the dimensions, and by making a second bank of keys, consisting of the sharps and flats, a project may be worked out for the more advanced woodworker.



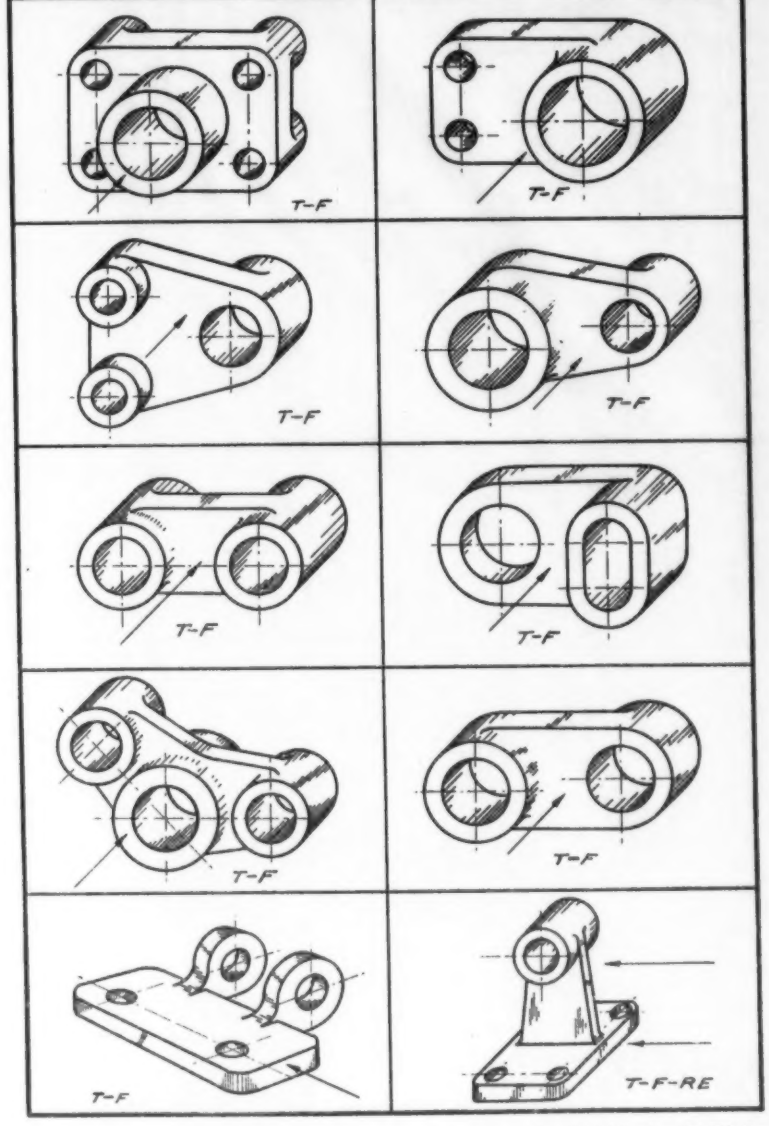
To be Reproduced for School Shop Use Only
Copyright, 1932, The Bruce Publishing Company

FREEHAND SKETCHING. TANGENTS. No 7.



Submitted by Jonathan Bright, Erie, Pa.

FREEHAND SKETCHING TANGENTS. No 8.



Described Elsewhere in This Issue

Periodical

TRACING SUPPLEMENT No. 247, JULY, 1932
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

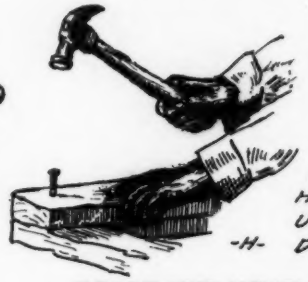
To be Reproduced for School Shop Use Only
Copyright, 1932, The Bruce Publishing Company

ELE. WOODWORK
CLIFFORD B. SMITH

STORY OF THE HAMMER

CLASS DEMONSTRATION SHEET — D-4

-G- THIS IS THE WRONG WAY TO HOLD THE HAMMER.



-H- GRASP THE HANDLE NEAR THE END AND USE AN ARM MOVEMENT FOR SPIKES.

AT -J- WE HAVE THE HOLD USED FOR LIGHT DRIVING

-K- IN WITHDRAWING A NAIL PROTECT WOOD.

-L- SETTING A NAIL.

TODAY IS THE SUM OF THE WISDOM OF THE AGES

PURPOSE — To note how the hammer progressed from a stone to the nicely balanced tool of to-day; to consider the modern form, parts and use.

THE LESSON — DEVELOPMENT — The hammer very likely was man's first tool. A

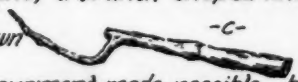
-A-

smooth stone, such as at -A-, held in the hand, was the means of awakening man to the power and wonder about him, and still about us, unrecognized and unused. In that dim age he began his exploration of nature's possibilities and to re-think the thoughts left there by the Maker of All. He slowly and painfully moulded crude materials to principles that always existed, uncovering to his blind eyes truths older than himself, which he has not the mentality to fully grasp. As a helpless babe explores his little world, so did man. He changed less than they changed him.

The little stone at -A-, only a pebble to our old word, made man superior to the wild beasts and started his career as a user of tools. He is to-day, in nearly every walk of life, primarily a user of them.

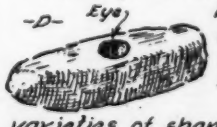
-B-

In time perhaps a strip of sinew or hide tied to a stone gave man an appreciation of leverage. A hammer and an arm together are a lever. It did not take a great number of aeons before a hollow was worn around a stone, a branch shaped like -C- bound around it and held as shown at -B-.



-C-

The next improvement, made possible by the use of the principle of the drill, is shown at -D-. An eye bored thru the head made possible a more secure method of hafting.

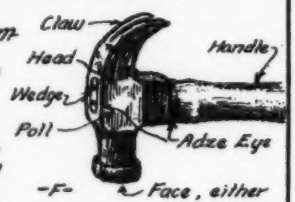


-D- Eye

The Age of Bronze brought the cast hammer head. This furnished a better balanced tool, a truer face and saved a tremendous amount of labor. With the use of iron many varieties of shapes were made. The chief improvement perhaps being the claw. See -E-

The modern hammer is as varied in shape and size as is industry itself. From small tack hammers to the blacksmith's sledge and the steam-hammer of industry. We consider in this case only the wood-worker's claw hammer.

FORM — At -F- we have the modern hammer. Every line has been carefully thought out. The adze eye, which gives a longer bearing for the handle in the eye, and the bell face are modern improvements. Balance could be included also.



PARTS — The head. This includes all but the handle. It is made of steel, hardened enough to stand blows within reason, yet not so hard as to be brittle.

The face. When it is flat it holds to the nail better, but is more apt to mark the wood. The bell or rounded face is harder to control.

The claw. Used to withdraw nails. See above.

The handle. This is made of hickory and is carefully shaped for the hand.

USE — The average boy "chokes" the hammer. He holds it with his hand close to the head, unconsciously imitating the savage who used the stone -A- in the same manner. He has to be taught the two swings of the hammer; one for brads, the other for large nails and spikes. At -H- is shown the correct hold for heavy work. At -J- is shown the manner of holding the hammer for light driving.

QUESTIONS — What does bell face mean? What is the name for the other type of face? What is the advantage of the adze eye over the plain eye? What precautions should be taken when withdrawing nails with the claw? Why is hickory used for the handles of many hammers? How can you partially remove hammer marks?

Designed by Clifford B. Smith, Buffalo, N. Y.

When this instrument is adopted as a class project, the music instructor may be invited to take charge of the boys to organize a marimba band, when all of them have completed their instrument. In this way the shopwork may be correlated with the activities of the music department.

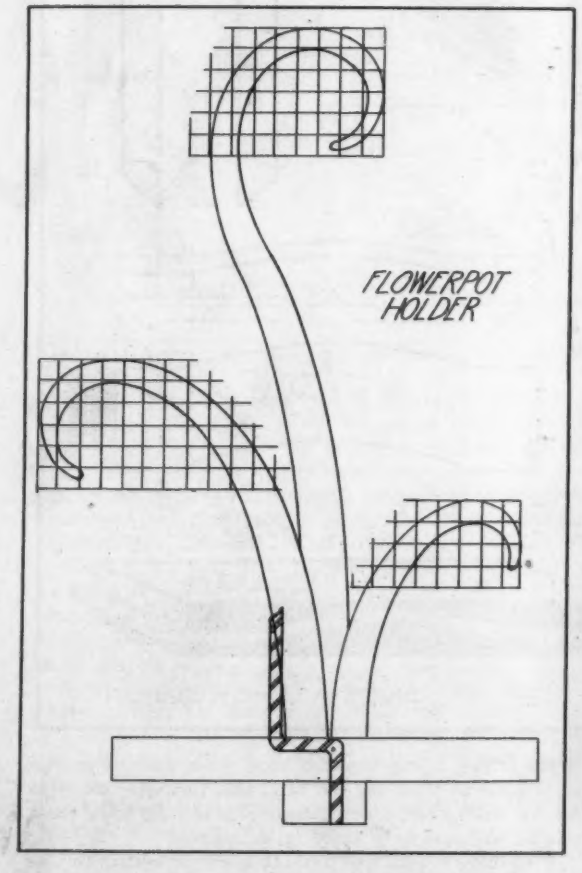
The appearance of our marimba band at P.T.A. meetings, Chamber of Commerce banquets, and other social gatherings has attracted a great deal of attention and it offers unlimited opportunities for publicity for the shops and the instructor.

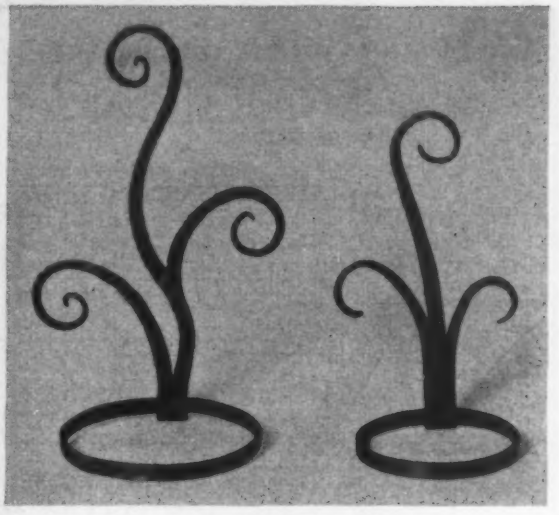
FLOWERPOT HOLDER

H. M. Andersen, Morton High School, Cicero, Illinois

The flowerpot holder shown herewith is made of four pieces of ⅛ by ½-in. mild steel. The determination of the length of the pieces which form the back, and the diameter of the ring of the pieces, is left to the student. The three pieces for the back are tapered. The taper should be long and gradual and the thickness of the material should not be changed. After the tapering, bring the pieces to an even heat and work the scrolls over the horn of the anvil. Place the three pieces together so that the two shorter ones come together over the longer one which is in the center. Mark the center one and cut it to fit between the others. The pieces may then be welded together with a torch. Then bring the base to a red heat in the forge and offset as shown in the sectional view. This is to allow for the rim of the pot.

Cut the required stock to form the pot support and form it for the circle in the forming rolls. Weld the ring thus formed to the back even with the offset, after which file down the welded section and smooth up some of the other high spots. The entire job is then to be finished off with emery cloth leaving the low spots in the work untouched. The whole project may then be slightly warmed after which it may be rubbed with a preparation of beeswax, turpentine, and varnish.





FLOWERPOT HOLDERS

MAKING A FOLDING BRIDGE CHAIR

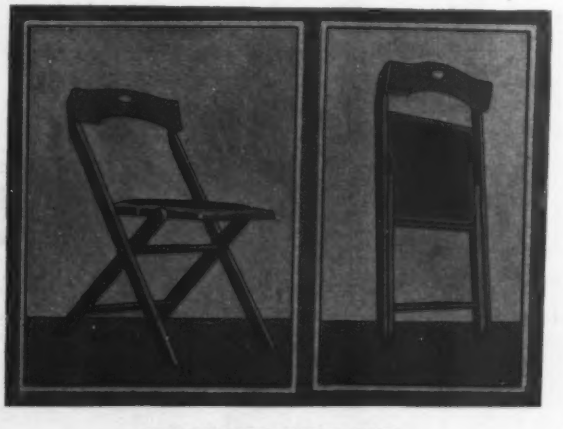
F. Clarke Hughes, Spokane, Washington

The folding chair shown in the accompanying drawings is a piece of furniture that is very simple to construct and the cost in the way of materials is very low. As a problem for the industrial-arts shop it is very satisfactory, and it is popular with the boys.

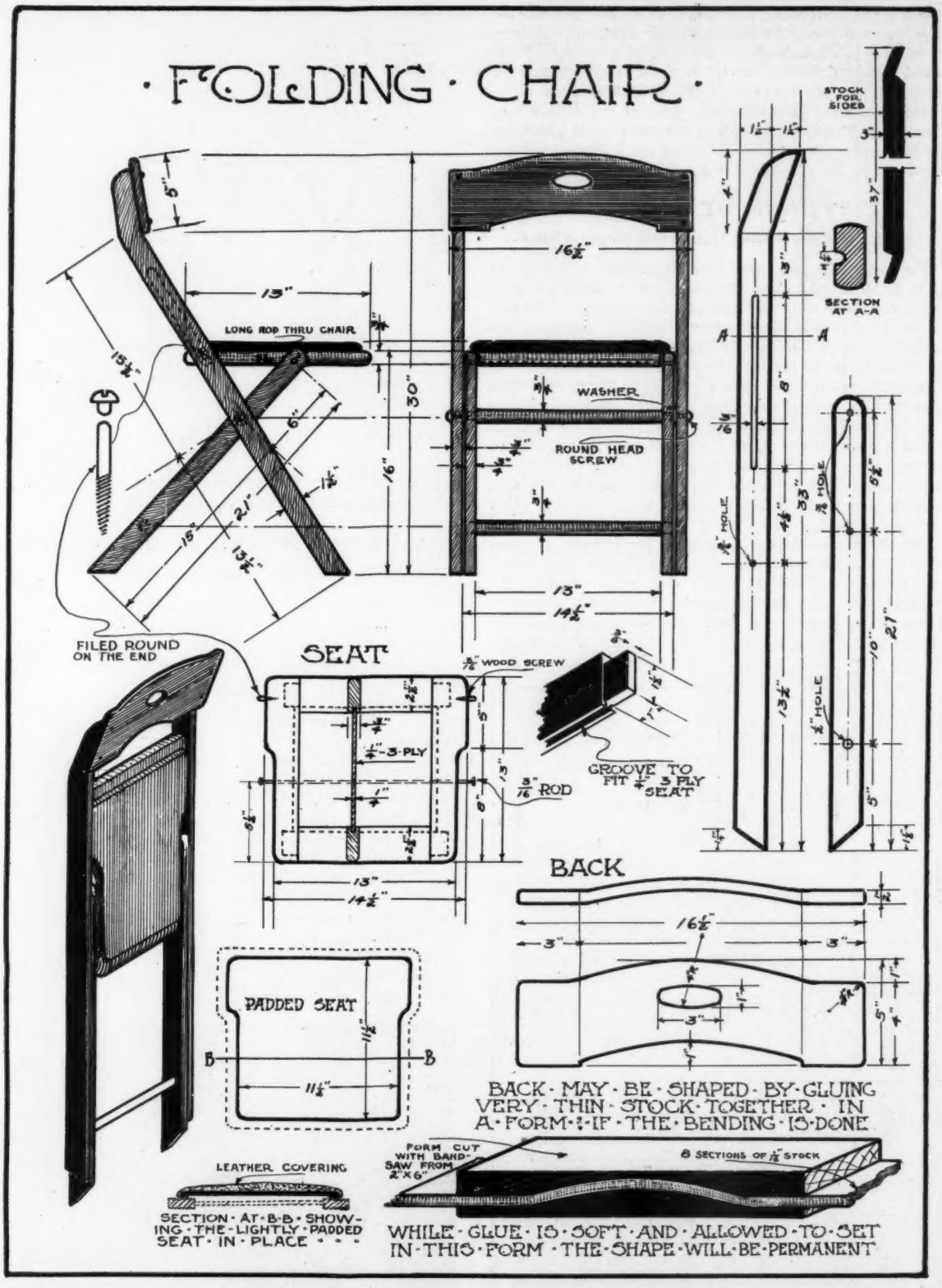
If these chairs are made in sets of four and lacquered to match a folding table the result is an attractive bridge or breakfast set that will cost but little, and which may be stored or packed in the space usually occupied by a single chair of ordinary style and size.

For the side pieces it is best to use some tough hard wood, such as birch or ash, though fir, spruce, or any one of a number of other woods are quite satisfactory. In order to simplify the material list, it might be said that for these legs or upright pieces the stock should be 1 piece of hard wood, ¾ by 3 by 21 in., and 1 piece, ¾ by 3 by 37 in. These, when squared up and ripped, will give the two front and the two back legs.

For the frame of the seat almost any kind of material may be used that conforms to the size, unless the chair as a whole is to be given a stained finish, making the grain of the



THE FOLDING BRIDGE CHAIR


FOLDING CHAIR
STOCK FOR SIDES
SECTION AT A-A
LONG ROD THRU CHAIR
WASHER
ROUND HEAD SCREW
FILED ROUND ON THE END
SEAT
WOOD SCREW
GROOVE TO FIT 3 PLY SEAT
ROD
HOLE
BACK
PADDED SEAT
BACK MAY BE SHAPED BY GLUING VERY THIN STOCK TOGETHER IN A FORM IF THE BENDING IS DONE
LEATHER COVERING
SECTION AT B-B SHOWING THE LIGHTLY PADDED SEAT IN PLACE
FORM CUT WITH BAND SAW FROM 2"X6"
8 SECTIONS OF STOCK
WHILE GLUE IS SOFT AND ALLOWED TO SET IN THIS FORM THE SHAPE WILL BE PERMANENT

wood an item to be considered, in which case all of the parts should be of the same kind of wood. For the panel of the seat the material should be 3-ply veneer, though a piece of solid wood of the right thickness will answer quite well.

The two round wooden rods may be either planed or turned on the lathe, or dowels such as broom sticks may be used. A few screws, a long wire rod, some small washers, and the extra piece of stock for the back rest, completes the stock list for making one chair. If more than one are to be made, this list will have to be added to, as required.

The groove in each side piece, to allow the bottom to slide when folded, may be cut with a small gouge or chisel. It

should be noted that these two long pieces are not the same, as one is a right-hand leg and the other a left-hand one, and the grooves must be cut accordingly.

The crosspiece on the back of the chair is shown in the drawings as a curved piece, and while the curved back is best for comfort and appearance there is no reason why the back may not be straight if the bending of this piece seems to be too complicated for the student. If several thicknesses of very thin veneer are glued together in the curved position as shown in one of the accompanying sketches the results are surprisingly solid and attractive. Another way to produce the curved back is to saw the curve with a band saw from a piece of stock thick enough to allow for the curves.

The seat should be made with mortise-and-tenon joints to prevent the danger of warping that might occur if a solid piece of wood were used. The plan of the seat with the long rod to keep it in place may be seen in one of the sketches. A washer should be used under each head of this long rod and between all movable parts of both this and the others of the bolts and screws.

The pad for the top of the seat may be either a leather covering, or one of the embossed paper or fiber chair seats that are sold at the five-and-ten-cent stores. The purpose of the covering is to improve the appearance and make the chair more comfortable.

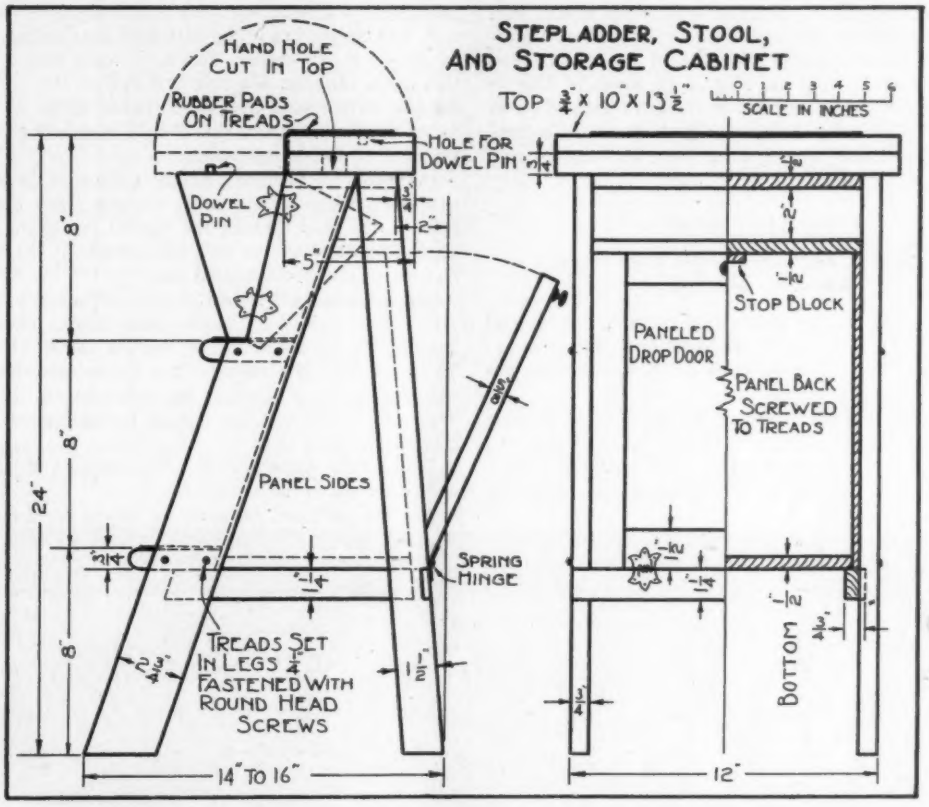
When the chair is finished it should be given one or two coats of either flat white or any of the many undercoats or priming paints that are used for preparing the surface for the lacquers. When this undercoat is sanded lightly the surface may be covered with one or more coats of any of the commercial lacquers. Either one or a combination of several harmonious tones or colors may be used.

A combination that is very cheery and striking is a chinese red with the seats, and perhaps part of the edges, done in a glossy black.

COMBINATION STEPLADDER, STOOL, STORAGE CABINET

R. M. Hammes, Abraham Lincoln High School, Council Bluffs, Iowa

The stepladder described and illustrated in this article is a very practical piece of kitchen equipment. It is a combination ladder, stool, and storage cabinet for shoe polishing, window washing, or dusting equipment. The wings at either side swing so as to support the top when turned down to form a seat. The dowel pins hold the wings in place. At the back, a drop door admits to the storage space. Spring hinges keep the door shut. Rubber pads on the treads are an added safety feature. The stool may be finished in colors to match the kitchen furniture.



TWO PLASTIC-WOOD SUBSTANCES

Charles M. Rice, North Junior High School, Everett, Washington

No. 1. A plastic substance in the form of a wood putty that quickly hardens may be readily made in the school shop. Make up the following liquid in an open-mouth bottle that has a good cover or cork:

Fill the bottle partly full of amyl acetate (banana oil), add a little acetone and thicken the liquid with scraps of transparent sheet celluloid. After the celluloid is dissolved the liquid is ready for use.

Collect enough fine sawdust to make up the required amount of putty and place it on a smooth surface, then stir in the liquid celluloid and knead until plastic. The putty thus formed will adhere to wood or metal and may be put to many uses in the shop. The putty may be kept in an airtight can for future use. Use lacquer thinner to soften it.

If no amyl acetate is handy for making the liquid celluloid,

try a good grade of commercial acetone lacquer thinner. Equal parts of acetone, amyl acetate, and benzol mixed with transparent celluloid will form a good binder for the sawdust.

This binder is also a very satisfactory cement for use in the construction of model airplanes. Acetone lacquer thinner is usually available in school shops, and transparent celluloid from old or unused automobile curtains is easily obtained.

No. 2. Another form of wood putty that may be readily made up from materials found in the school shop is made as follows:

Mix up a quantity of casein glue. After the glue is properly mixed, it may be stirred into a quantity of sawdust, kneading the substance into a plastic state. The putty thus formed may be used for molding forms on book ends, lamp stands, etc., or pressed into plaster-paris molds for the formation of furniture decorations. When dry, this material is very hard and has a smooth surface. It is not affected by moisture. Due to the nature of casein glue, the sawdust changes color and therefore cannot be used for filling cracks in furniture colored with the lighter stains, as might be the case with the first putty suggested.

FILE HOLDER

F. N. Newton, Jr., Sharon Senior High School, Sharon, Pennsylvania

In machine-shop practice it is necessary to do a great deal of filing, especially in assembling finished jobs. This often necessitates filing flat surfaces, which is a difficult operation unless one has some way to hold the file properly.

The file holder described herewith has been found to solve this problem very nicely. The construction is not difficult and the holder can be made in a school shop equipped with a lathe, drill press, and shaper. It is so designed that it will take a 10-, 12-, 14-, and 16-in. file.

The brace and tie rod may be forged in the forge shop, thereby furnishing that department with a practical project. The aluminum handle may be cast in the foundry or it may be turned from a bar of aluminum. The wooden handle may be purchased or it may be made in the woodshop.

Making the File Holder

In making the tie rod the lathe and shaper are used. Put the rod in the vise of the shaper and shape the slot for the end of the file. Remove the live center from the headstock of the lathe and chuck the tie rod. Shove the rod back to within about an inch of the end on which the thread is required. Before chucking, a center should be put in the end of rod so the center in tailstock can be used to hold job firm. If it is not convenient to cut the tread in a lathe, it may be cut with solid dies.

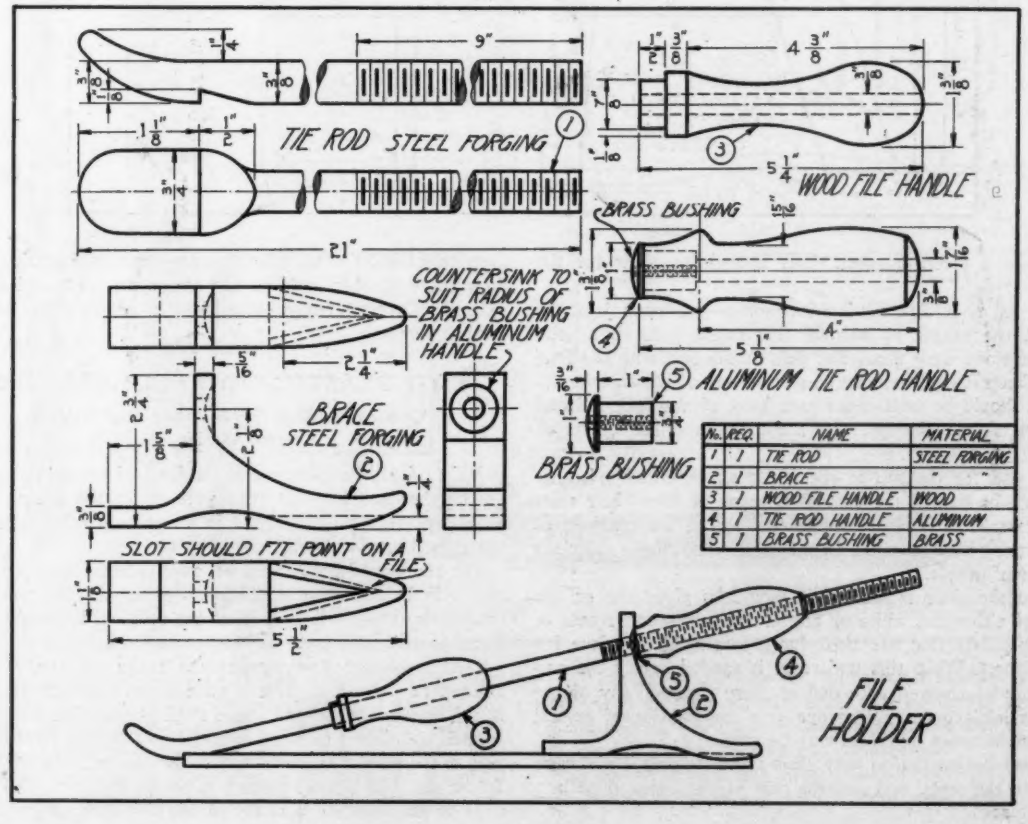
In making the brace, the part that rests on the file should be shaped in the shaper. This is the only part of the brace that needs finishing. The hole is drilled on the drill press and the hole countersunk the desired radius of the brass bushing in the aluminum handle. This is done by grinding the countersink drill to the desired radius.

In making the aluminum handle, place it in the lathe chuck, and counterbore for the brass bushing. Then drill a ⅜-in. hole all the way through the handle for clearance for the threaded part of the tie rod. The outside of the handle may then be turned to the desired size.

The brass bushing should be made of round brass. Place a piece about 3 in. long in the lathe chuck, leaving approximately 1⅝ in. projecting beyond the chuck. Drill the hole ¼ in. to allow for tapping. Turn the outside allowing about one thousandth of an inch for a tapping fit. Tap the hole with a $^{5}/_{16}$-in. U. S. S. tap. Cut off to the desired length with a bent cutting-off tool.

Drill a hole, slightly smaller than the tie rod, near the slot end of the rod in the wooden handle.

File the parts and assemble the job as per assembly drawing.


TIE ROD STEEL FORGING
WOOD FILE HANDLE
BRASS BUSHING
COUNTERSINK TO SUIT RADIUS OF BRASS BUSHING IN ALUMINUM HANDLE
ALUMINUM TIE ROD HANDLE
BRACE STEEL FORGING
SLOT SHOULD FIT POINT ON A FILE
FILE HOLDER
No. REQ. NAME MATERIAL
1 1 TIE ROD STEEL FORGING
2 1 BRACE "
3 1 WOOD FILE HANDLE WOOD
4 1 TIE ROD HANDLE ALUMINUM
5 1 BRASS BUSHING BRASS

A SHEET-METAL SIDE WHEELER

R. W. Wagner, St. Paul, Minnesota

The small power boat described herewith is very interesting and may be easily made.

If the builder wishes a hull that looks more like a real boat, he can make it of tin plate. Two pieces are required, as shown in Figure 2. If new tin is not available, sufficient metal to make the boat may be salvaged out of galvanized tin cans such as are used for packing fruit.

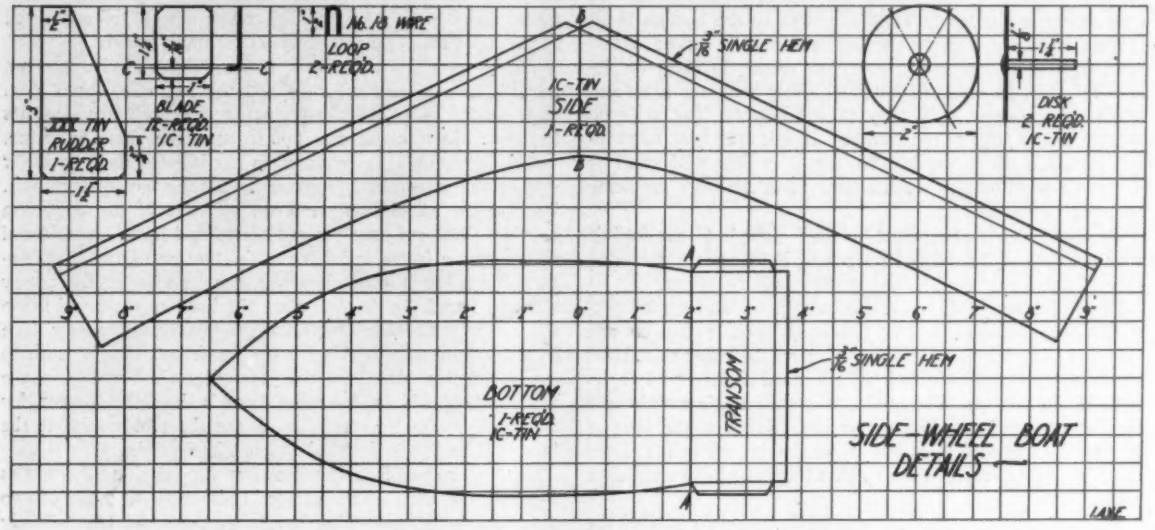


FIG. 2. SIDE-WHEEL BOAT DETAILS

The simplest hull for this side wheeler may be made out of a large, flat, oval tin can such as is used for packing fish. The large-sized cans, which are about 8 in. long, are about right. The edges of the can should, of course, be made as smooth as possible.

The first step is to make the patterns shown in Figure 2 out of cardboard. After the outline has been drawn, cut out the pattern and then transfer it to the tin by scribing around the pattern with a scratch awl or a pointed nail. Then cut out the parts with tin snips.

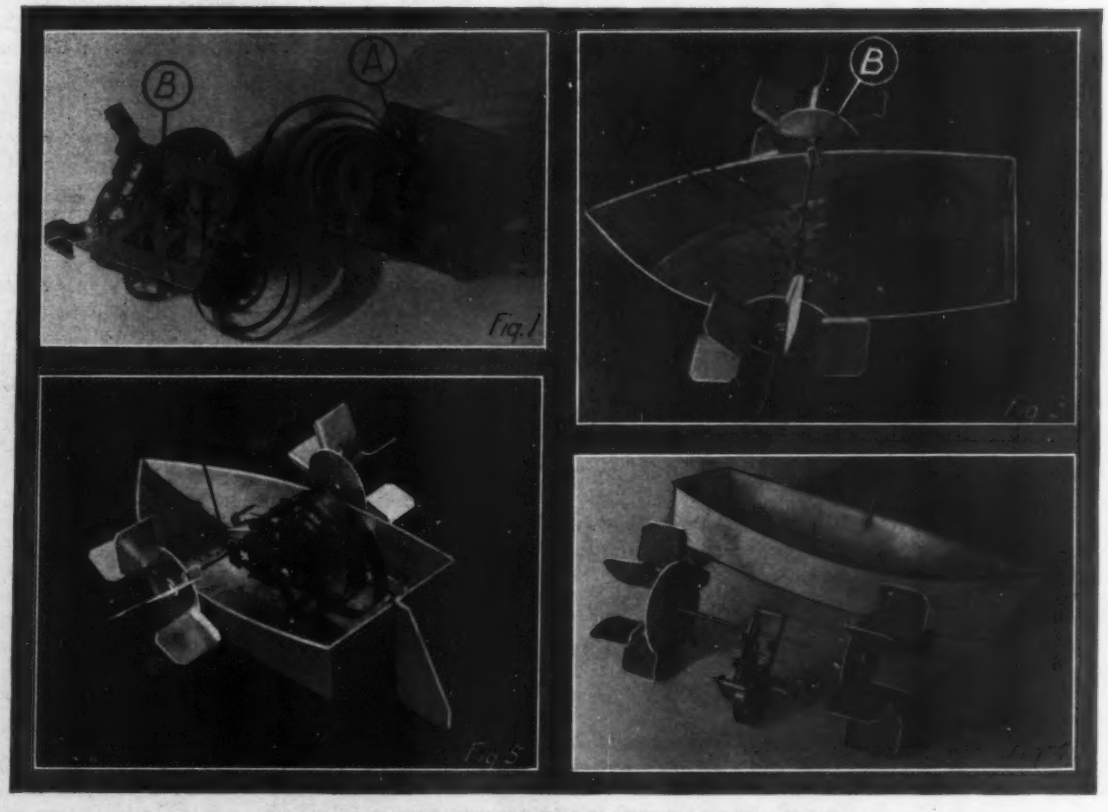


FIG. 1. TWO TYPICAL MOVEMENTS FROM ONE-DAY ALARM CLOCKS
FIG. 3. HOW THE POWER PLANT IS INSTALLED
FIG. 4. A LIGHT-WEIGHT MOTOR WITH PADDLE WHEELS ATTACHED
FIG. 5. HOW THE RUDDER IS ATTACHED

Next turn the hems on the three edges indicated in Figure 2. This may be done on a bar folder or over a sharp metal edge with a mallet. Now crease and bend the bottom on line AA so that the hem is toward the outside. Then bend in the two laps on the transom. The sides should next be curved by drawing them over the edge of the bench, while holding the ends firmly in the hands. Hold the sides to the bottom piece frequently to see whether they are sufficiently curved. When both sides have been properly curved, crease the piece on the line BB, thus forming the cutwater. Now bend the sides and shape the cutwater until they fit the bottom. The sides go outside of the laps on the transom. It will take time to properly fit the sides to the bottom, but it is time well spent as it saves a great deal of trouble later when the sides are being soldered to the bottom.

The soldering copper must be well tinned. If the hull is made of new tin, powdered rosin may be used as a soldering flux. If old tin is used, soldering paste will be better.

Begin the soldering at the cutwater point and work backward along the chine seams. Solder an inch or two on one side and then move over to the seam on the other side. Hold the boat up so the side and bottom make about equal angles with the bench top. The solder will then settle evenly into the seam instead of piling up on the bottom of the boat as it would if the hull were left to lie flat on the bench. Keep the edges of the metal even so that they do not overlap each other.

When the chine seams are watertight, the two laps of the transom must be soldered to the sides. This may be done by placing flux between the surfaces and running a little solder along the edge of the lap. Then when the flat surface of the copper is pressed down on the lap, the two surfaces will be sweated together. As soon as the solder melts and runs, the soldering copper should be taken off the joint and the parts held very still until the solder has hardened. If necessary, the joint should be held together with the point of a screw driver or with a piece of wood.

The rudder should be made of heavier tin. If none of this is at hand, a piece of tin may be folded double, and the crease hammered flat. When laying out the rudder this crease should be forward.

Make a mark square across the transom at the middle to show where the rudder is to go. Then solder the rudder in place, running a seam of solder along each side of it where it joins the hull.

The Paddle Wheels

The details for the paddle wheels are shown in Figure 2. Draw two circles 2 in. in diameter on tin. With the compass set at 1-in. radius, divide each circle into six parts by stepping off this distance on the circumference of the circles just drawn. Then draw radial lines from these points to the center. These lines give the location for the blades.

Next cut out the two disks, after which make 12 blades as shown in Figure 2. The first one, after being cut out, may be used as a pattern for laying out the rest. Cut off all corners slightly to improve the appearance. Then bend over the ends on the line CC to a square corner.

Next sweat the turned edges of the blades to the disks, allowing ¼ in. of the blade to extend over the edge of the disk toward the center. Figures 3, 4, and 5 show how the blades look after they have been fastened to the disk. Be sure to make one wheel right and the other one left; that is, if one has been made with the turned edges pointed to the right, the other one should have these edges pointing left. When the boat is in motion, the turned edges should point backward.

Make the two wheel shafts out of ⅛-in. diameter wire. If no wire of this size is on hand, nails ⅛ in. thick may be used. Tin the ends of the shafts and solder them to the disks. Punch a hole in the disk for the shaft. Clamp the shaft in a vise so that the disk can be fitted over it and held in place while the soldering is being done. Use care to get the shafts square with the disks so the wheels will not wabble.

Power Plant

An old spring motor salvaged from a discarded toy locomotive may be used as a power plant. Figure 3 shows such a motor installed in the hull. The paddle wheels are connected to the shaft that originally carried the drive wheels.

Before installing the motor, remove all parts that are not needed, such as the governor and the two idle wheels with their shaft. Then very carefully pry the two drive wheels from the shaft taking care not to bend the shaft or frame.

The motor must be mounted in the boat so that the lower side of the drive shaft is in line with the edges of the sides, because the wheel shaft rests on the edge of the boat as a bearing. Clips are then cut out of tin and these are soldered to the motor frame and later to the bottom of the boat. Before the latter is done, however, the location of the motor must be found. To do this, place the boat in water and move the motor back and forth until the boat sets properly. The balance from side to side is very important, too. Be sure to get the motor placed so that the sides sink evenly in the water. About 4½ in. from the stern is the right location for the drive shaft. Be careful to locate the motor so that the boat will be driven forward and not backward.

Next make two flexible connectors for attaching the wheels to the drive shaft of the motor. These may be made of two 1-in. lengths of coil spring having an inside diameter slightly less than the sides of the drive shafts and wheel shafts. Spring curtain rods are usually available in this size and may be used for this purpose. Force the connectors on the drive shaft on the motor and on the wheel shafts. There should be a space of ¼ in. between the disks and the sides of the boats. Such a connector is shown in place at B Figure 3. Make the two U-shaped wire clips that are shown in Figure 2 and place them over the drive shaft. They are to act as bearings and must be soldered to the sides of the hull. Be careful that the shafts line up with the motor and that the U-shaped clips do not bind them.

(To be continued)

FRUIT BOWLS THAT ARE DIFFERENT

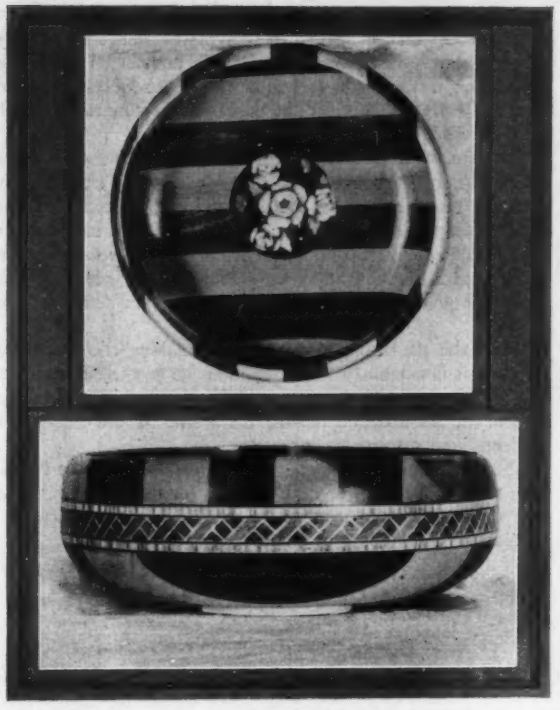
Wayne M. Judy, Clear Lake, Iowa

If one wishes to diverge slightly from the commonplace in fruit bowls, the author has found that the two described herewith offer an excellent opportunity.

Either one of these bowls may be made by an advanced woodturning student, provided he has had previous work in gluing, sizing of stock, and surfacing. A great deal of caution must be used in the selection of stock so that all materials used are equally well seasoned. If they are not, there will be unequal contraction which will be sure to cause opening of joints or checking.

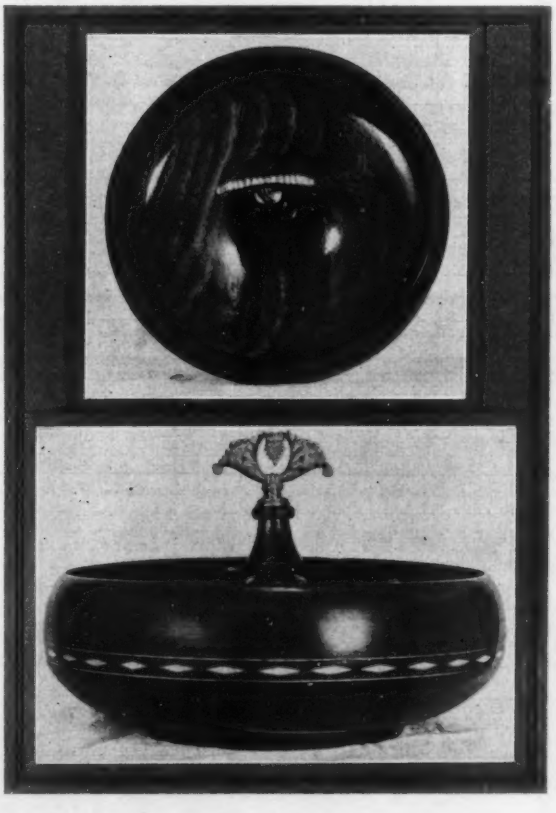
The most interesting of the two bowls is the striped one, and although it looks rather difficult it is, in reality, quite simple. It is made up of white-maple and black-walnut strips, 1¼ by 1¼ by 10 in., glued up into two separate pieces, 1¼ by 10 by 10 in., and these, in turn, are glued together, surface to surface, with the stripe crossing at right angles. Before gluing the strips it is well to heat them so that the glue will stay thin while the clamps are being set. It is also very important to have the exact centers of the two main pieces coincide or the pattern will be unbalanced—that is, there will be a larger design on one side of the bowl than on the other.

It is not necessary to have the inlaid design in the bottom or around the outside of the bowl, but it undoubtedly adds to the attractiveness of the finished work, and it is the opinion of the author that the inlaid band serves to strengthen as well as to enhance. This inlay design may be purchased from firms handling marquetries or border strips.



The design in the center is glued into a recess 1/16 in. deep. It may be glued into place while in the lathe by using the tailstock as a clamp and a circular piece of pine the size of the inlay for a protection block. It is well to place a piece of paper between the block and the inlay to keep the latter from adhering to the former.

The band around the outside of the bowl is also set in 1/16 in., and is glued into place by using a jig made up of a piece of light sheet metal 1 in. wide and as long as the circumference of the bowl. This strip is tacked to the jaws of a wood clamp so that pressure can be applied, thus forcing the inlay into place and holding it secure until the glue has set. In cutting the inlay it is necessary to cut it 1/4 in. longer than the distance around the bowl so that a half-lap "V" joint can be made.



The plain bowl is somewhat similar to the striped one in design and construction, with the exception that the handle post is left in the center. The handle makes this bowl somewhat different from the general type of fruit bowls, and is put on in order that the bowl may be used more readily for serving, and also to add to its attractiveness. The handle is a metal furniture knob, and one like, or similar to, the one shown may be purchased from any hardware jobbing house. It has a 3-in. threaded shaft which is very convenient for holding the entire handle assembly together. It is necessary to turn a separate extension for the handle post in order to gain the proper height for a balanced appearance.

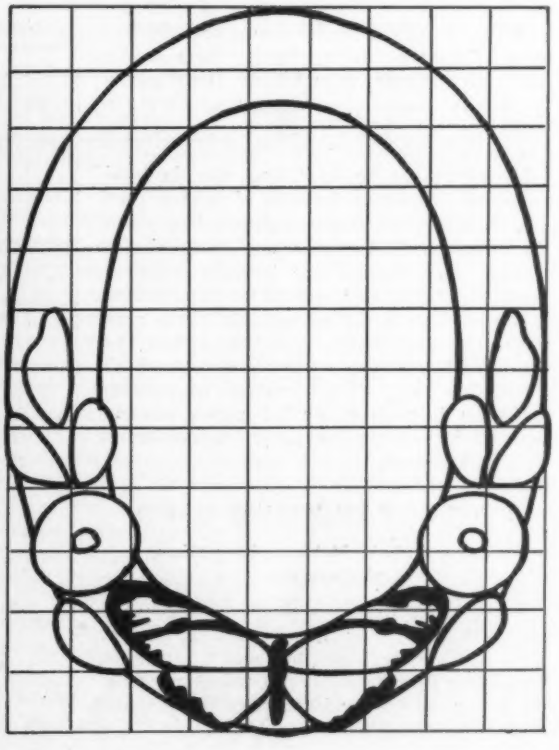
The following operations are encountered in turning one of these bowls:

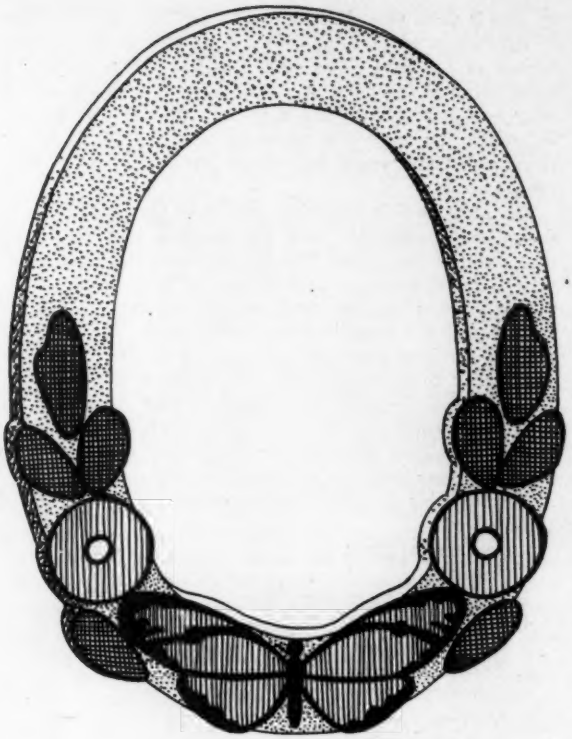
1. Selection of stock
2. Surfacing
3. Working to exact dimensions
4. Gluing
5. Opportunity for originality in design
6. Faceplate turning
7. Spindle turning in case of the plain bowl
8. Inlaying
9. Wood finishing

AN OVAL FRAME

Hazel F. Showalter, Davenport, Nebraska

The small oval frame pictured is suitable for holding a favorite snapshot of a vacation scene or perhaps a photo of a friend. It may be made out of a 5½ by 6-in. piece of any thin material suitable for coping-saw work.





THE FINISHED FRAME

To make the pattern, draw a rectangle 5½ by 6 in. on a piece of paper, and mark the rectangle into half-inch squares. Then draw the lines of the pattern through the squares as shown. Cut out the pattern and use it as a template for transferring the shape on the wood.

If a frame of a different size is wanted, draw an oval in the size desired, then cut out the butterfly shape, the flower shapes, and the leaf shapes from the first pattern, lay them on the new oval, and mark around them. The design is suitable for oval frames up to 9 or 10 in. in height and for slightly smaller frames than the one shown.

Having cut out the shape, sandpaper the wood well, slightly rounding the edges of its face. Then give the entire surface a ground coat, after which the design should be transferred on to it with carbon paper. Enamel the butterfly a bright brown, the flowers blue, and the leaves green. The frame may be gilded or enameled light gray mixed with a small amount of green or tan. The line around each spot of color is optional. Both the outlines and the black markings on the butterfly may be made with a ball-pointed pen and india ink if the worker has never done fine brushwork with enamel.

STUDENT PROGRESS CARD

Chester A. Lyle, McKinley High School, Canton, Ohio

The time required for grading each pupil each day at McKinley High School printshop, Canton, Ohio, has been cut down to about five minutes per section (four sections of 80-minute periods), for a total of 104 students, since the progress card shown herewith has been adopted.

This card allows spaces for 30 days, that is, for six weeks, since a report card is sent to the parents every six weeks. The course is developed under a group, unit, and lesson plan. The periods are divided into eight units of ten minutes each and these units are noted under the description column along with the different lessons or work done.

The date and time-commenced, and the time-finished columns are not inserted with the idea of solely keeping track of the student's speed, but rather that he can have an accurate value of his ability at all times. These grade cards are used by the student every day and his grade is entered each day, so that he knows his class standing at all times. This fact alone has made for greater interest, incentive, and carefulness by the student.

While the student uses a pencil for making the entries on his card, it is necessary that the grades be marked in ink.

The citizenship items are valued for the part played by the student in his attitude toward his work, toward his fellow students, and toward his instructor.

The entries in the column marked *description* make it possible to keep a record of each student for the school year, so that those interested may know exactly what a student accomplished on any day of the school year.

WIRE BANDER

J. Trus Hayes, Camden County Vocational School, Merchantville, New Jersey

The wire bander shown herewith is a tool that is very handy to have around when repairing leaky water-hose connections or anything where it is desired to band wire around an object very tightly.

STUDENT PROGRESS CARD

NAME OF STUDENT Period Home Room Section

CITIZENSHIP—[ ] Reliability: Keeps his word, is trustworthy. [ ] Co-operation: Works well in a group. [ ] Obedience: Respects law and order, is willing to follow directions. [ ] Self-control: Keeps temper, cheerful under difficulties. [ ] Thrift: Makes good use of time and cares for personal and public property. [ ] Courtesy: Respects the opinions and rights of others, considers when others talk, polite in speech and action.
In rating Citizenship traits: A means Excellent; B means Satisfactory; C means Unsatisfactory. Check this item every six weeks.

Group	Unit	Lesson	DESCRIPTION	Date and Time Commenced	Time Finished	Total Periods	Grade

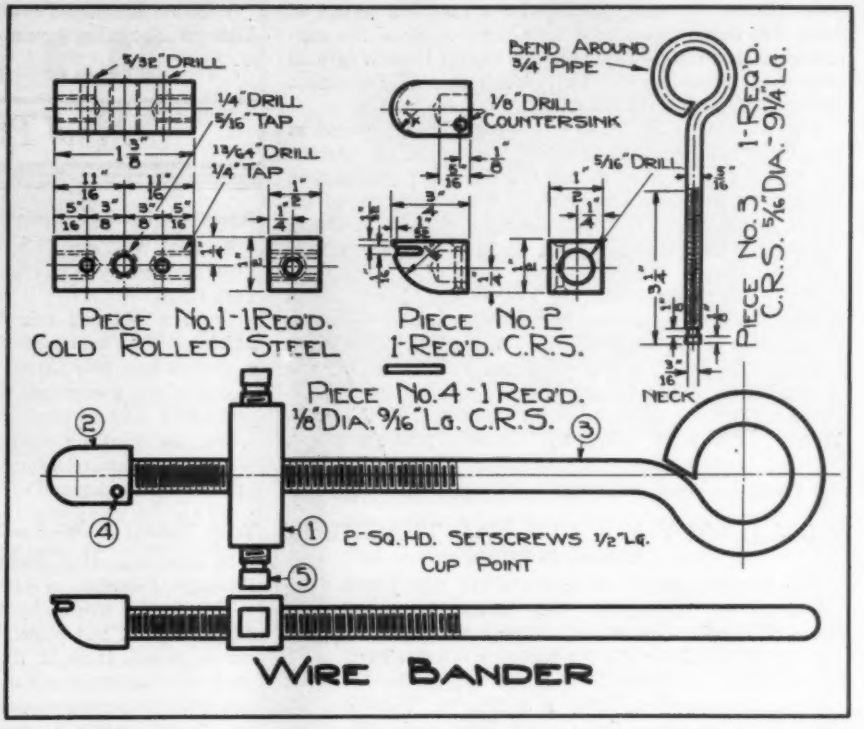
McKinley High School Print Shop, Canton, Ohio

Group	Unit	Lesson	DESCRIPTION	Date and Time Commenced	Time Finished	Total Periods	Grade

REMARKS:

FACE AND REVERSE OF THE STUDENT PROGRESS CARD

This project has been successfully made by boys in the general-metal and elementary-machine-shop classes. The drawing is self-explanatory and the operations necessary to make the bander can easily be listed by the instructor or by the pupils. If the pipe has a few grooves ground or filed around it where the wire goes around the hose, a connection will be made that will withstand a great deal of abuse.



Among Industrial-Arts Teachers

¶ Charles R. Bostwick, principal and manager of the Poppenheusen Institute, College Point, Queens, New York City, died in a New York hospital recently, after a long illness. He was 51 years old. Mr. Bostwick was a graduate of the Sheffield Scientific School of Yale University and held a master of arts degree from Columbia University. Mr. Bostwick had been a teacher all his life and had held a number of administrative positions.

¶ Mr. H. H. Porter, of Central State Teachers' College, Edmond, Okla., has been appointed director of the vocational rehabilitation division of the state education department.

¶ Mr. Carl Bertram, of Appleton, Wis., has been elected president of the Appleton Education Association.

¶ Mr. Walter B. MacDougall, director of the vocational school of Atlantic county, Hammonton, New Jersey, died at the age of 40, following a brief illness due to blood poisoning.

¶ Mr. George V. Jensen has resigned as manual-training instructor at West Waterloo, Iowa.

¶ Mr. Adolph Guyer has been appointed a member of the vocational-school board of Appleton, Wis., to succeed the late Fred Bachmann.

Now, Are There Any Questions?

Antique Maple Finish

961. Q.: I am at present making a chest of curly maple to be used in a room with an antique bed and table of maple. I would like to know how to age the new wood artificially to match the old pieces. — *T. J. B.*

A.: To obtain the so-called antique maple finish, it is necessary to first get golden undertone. Sponge, dry, and sand the wood with at least a 4/0 paper. Next dissolve 1 oz. of potassium dichromate in a gallon of hot water. Apply and let dry. If this stain coat has produced any roughness, then resand with some of the paper previously used. Next apply a stain coat of 1 oz. of any standard walnut stain powder in a gallon of hot water. This should be a brown and not a black shade. Apply it freely and wipe it off as soon as possible, to obtain any depth of brown desired. It is suggested that this method be worked out on well-sanded scrap material in order that the correct amount of brown be known before the piece itself is attempted. In this manner, a correct formula will be developed which may be duplicated at any time.

For a finish, one or two coats of shellac and shellac mixing lacquer may be used. The shellac may be half orange and half white, or only one or the other as judgment may indicate. Reduce to a two-pound cut with denatured alcohol and then pour into an equal amount of lacquer, made for this purpose. Sand between coats and oil-rub the last.

Two coats of varnish may be substituted if desired. Do not build up too heavy a finish on maple. — *Ralph G. Waring.*

Associations and Conventions

THE WESTERN ARTS CONVENTION

The thirty-eighth convention of the Western Arts Association, held at Saint Louis, May 4–7, has come and gone, but its memories will linger long.

This year, owing to the depression and the difficulty of some to get away for a longer time, the council concentrated all the program into an intensive round of continuous sessions, which opened on Wednesday evening and continued until the final session on Friday.

Those who came early were well paid for their effort. Greater Saint Louis with its many and varied institutions, its schools, academies, and colleges, offered many points of interest. Because of its numerous facilities, the New Jefferson housed everything but the school exhibits. The mezzanine floor made it possible to attend the whole convention and travel up only one floor.

The general subject for the convention was "Social Significance in Art Education." Dr. Frank Slutz talked on "The Teacher as an Artist Life's Sake"; Mr. John L. Bracken gave the banquet address, "But I Know What I Like"; and Dr. Homer J. Smith, of the University of Minnesota, discussed "The Arts and Vocational Guidance of Youth." Dr. Warner, in his report, as chairman of the research committee on

nomenclature, presented material for a complete session in itself. The report presented a three years' study of the committee and is a real contribution. Mr. George Donson gave an interesting discussion of "The Organization of Instruction Material in Junior High Schools."

Mr. William C. Wood, of Davenport, Iowa, presided at both industrial-arts sectional meetings. A few of the interesting topics were: "Ancient America Enriching the Modern World," by Dr. Herbert J. Spinden; "The Discovery of the Student's Personality," by Dr. Eugene Steinhof; "Research, Primitive Design, and Design in Nature," by John Gilbert Wilkins, Chicago.

Mr. W. S. Morgenthaler, of Des Moines, Iowa, gave a demonstration of his method of teaching mechanical drawing in the junior high school, and Mr. Bernard W. Noel, of Saint Louis, talked on "Coöperation Between Industry and the School in Curriculum Making."

Officers elected for the year were: President, Dr. William E. Warner, Ohio State University, Columbus; vice-president, Mattie L. Jarrott, Oklahoma City, Okla.; secretary-treasurer, Mr. Harry W. Wood, Indianapolis, Ind. — *G. H. Hargitt.*

NEW JERSEY VOCATIONAL TEACHERS' CONVENTION

The sixteenth annual convention of the New Jersey Vocational and Art Teachers was held March 17, 18, and 19 at the Berkeley-Carteret Hotel, Asbury Park, with approximately 900 members of the association in attendance.

Dr. Millard L. Lowery, superintendent of the Middlesex county schools, gave an inspiring address on "Vocational and Arts Education from the County Superintendent's Viewpoint." At the sectional meetings of vocational principals, directors, and supervisors of home economics and fine and industrial arts, the budget was discussed by five different speakers.

At a general meeting under the chairmanship of Mr. Amos Kraybill, of Asbury, Dr. Robert L. Cooley, of the Milwaukee Vocational School, spoke on the subject, "The Scope and Objectives of Part-Time Vocational Schools." He explained the purpose of part-time education as it was organized in the State of Wisconsin, and described the kind of work offered and the type of students for which the work was intended. The annual banquet was held in the evening, with an attendance of nearly 400 persons. Dr. E. B. Kent acted as the toastmaster. Dr. W. T. Read, of Rutgers University, also talked on the subject, "Viewing Modern Life Through the Eyes of Science," in which he elaborated on the dependence of modern life on the sciences.

Saturday morning was devoted to sectional meetings of the several departments of the association. Among the speakers on the program were Katherine A. Fisher, director of Good Housekeeping Institute; Mr. Thomas B. Stanley, of the department of marketing, New York University; Mr. G. M. McGarvey, of the Federal Board for Vocational Education; Mr. John Shaver, New York; Mr. Jacob Simonson, East Side Continuation School, New York City; Dr. D. J. MacDonald, University of Cincinnati; Dr. Maris M. Proffitt, Bureau of Education, Washington, D. C.; Dr. R. B. Cunliffe, Rutgers University; Dr. C. E. Partch, Rutgers University; and Miss Juanita H. Leonard, New York City.

At the general meeting on Saturday, a total membership of nearly eleven hundred was reported. The luncheon following the general meeting was attended by 350 persons, who listened to a talk by Dr. David Snedden on "Keeping Up with the Times in Vocational Education and the Arts of Education."

The following officers were elected: President, Mr. A. B. Wrigley; first vice-president, Mr. Percy Miller; second vice-president, Mr. Jack Penino; third vice-president, Mr. J. M. Shoe; secretary, Mr. R. O. Beebe; treasurer, Miss Ethel M. Powell.

A motion was passed to the effect that the council consider Asbury Park as the convention city for the next year. — *John M. Shoe.*

New Publications

Supervising Extra-Curricular Activities

By Paul W. Terry. Cloth, 417 pages, 5¾ by 8¼. Price, $3. Published by McGraw-Hill Book Company, Inc., New York City.

Teachers will find this book to be a good source from which to obtain help in their extra-curricular work. The book is divided into four parts; the first gives a historical background of the movement; the second shows how student organizations may be made helpful in the government of the school; the third is a description of the more important type of student organizations; and the fourth discusses the problems of organization and supervision.

Trade Training in School and Plant

By Herman S. Hall. Cloth, 500 pages, 5½ by 8, illustrated. Price, $3. Published by The Century Co., New York City.

This book is written by an experienced tradesman who by dint of careful and painstaking preparation made a teacher out of himself. It ought, therefore, be extremely useful to all teachers of industrial-arts and vocational education. The entire field of lesson preparation, class organization, and management for day and evening classes is covered by the book.

Shop Mathematics—Part I, Shop Arithmetic

By Earle B. Norris and Kenneth G. Smith. Cloth, 271 pages, 6 by 9¼, illustrated. Price, $2. Published by McGraw-Hill Book Company, Inc., New York City.

This is the third edition of this well-known arithmetic. It has been revised and enlarged and chapters on logarithms and slide rule have been added.

News Notes

Conduct School for Janitors

The Kansas State Teachers' College at Pittsburg, Kansas, in coöperation with the Kansas Janitor-Engineers' Association and the Kansas State Board for Vocational Education, will conduct its sixth janitor-engineers' school at the State College Building June 6 to 10. Among the topics to be taken up are industrial testing, a study of paints and varnishes, making of janitor tools, glazing sash, door-check adjustment and repair, and training in electrical theory and practice.

Issue Monographs on Industrial Lubricants

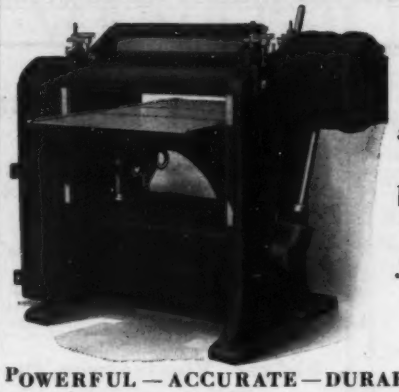
The Standard Oil Company, 910 South Michigan Ave., Chicago, Ill., has announced the publication each month of a monograph on the lubrication of some type of industrial equipment. The monographs will furnish specific technical information on the proper lubrication of various types of machinery, and each discussion is simple, brief, and informative. Detailed information may be obtained by addressing the technical division at 910 South Michigan Ave., Chicago.

Wisconsin Vocational Directors Conduct Survey

Directors of Wisconsin vocational schools, in coöperation with Robert Welch, of Stout Institute, and H. C. Thayer, of Madison, conducted a short survey of the academic program at the Fond du Lac Vocational School.

ADVERTISING PAGES REMOVED

"OLIVER"
Single Surface Planer



Unsurpassed for Value and Performance

POWERFUL — ACCURATE — DURABLE — SAFE

Here is a machine that has no equal for school shop work. It will surface up to 24 inches wide and to 6 inches thick at the rate of 35 feet per minute, producing a perfect, smooth surface. A minor adjustment permits this speed to be reduced to 21 feet per minute. Frame is of heavy cast iron. Ball bearing equipped throughout. 5 H. P. motor. Floor space 36 x 54 inches for "Motor-in-Head" driven machine.

Complete details on request.

Oliver Machinery Company
Grand Rapids, Michigan, U.S.A.
HIGH GRADE MACHINERY

...are furnished by 81 manufacturers on woodworking and metalworking machines that they sell to school shops and industrial plants.

The *confidence* of these capable judges is your *assurance*. When you buy machines that are "L.A. equipped," you receive *dependable* motors "fitted to the job"... that eliminate unnecessary machine parts... save power... and help make machines simple, compact, trouble-free, and *easy to operate*.

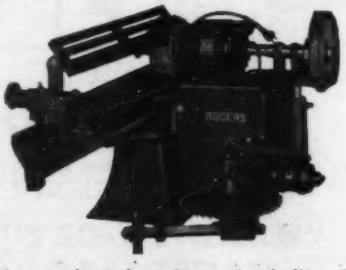
THE LOUIS ALLIS COMPANY
MILWAUKEE, WIS.
OFFICES IN PRINCIPAL CITIES

SCHOOL SHOP EQUIPMENT NEWS

FOR THE SUPERVISOR OR TEACHER WHO DESIRES TO KEEP ABREAST WITH THE NEWS OF NEW MACHINERY, TOOLS, SUPPLIES, ETC.

NEW ROGERS TYPE K ELECTRIC UTILITY GRINDER

The Samuel C. Rogers Company, 191 Dutton Ave., Buffalo, N. Y., has just announced its new Type K electric utility grinder. This efficient, yet inexpensive machine, is equipped with a table for face or surface grinding, knife or die grinding,



and also with a toolrest for edge tool grinding. Besides this there are attachments for sharpening circular saws up to 22 in. in diameter, and on special order it may be equipped with a 10-in. disk grinding wheel with adjustable table. A flexible shaft with outer bearing for housing emery or polishing wheel may also be obtained.

The entire machine is well made and rigidly mounted so that the carriage moves without vibration in either direction. The regular equipment comprises 1/3-h.p. motor, a 6 by 3-in. cup grinding wheel, 8 by ½-in. tool-grinding wheel, and an 8 by ¼-in. saw-gumming wheel. The regular equipment also includes the saw-gumming attachment and a toolrest.

Complete information about the machine will be furnished on request.

NEW SPECIAL ROCKFORD ECONOMY LATHES

The Rockford Machine Tool Co., Rockford, Ill., has announced a series of new special Rockford economy lathes which will appear in three sizes, 13 1/16-in. swing, 27-in. centers; 14⅝-in. swing, 37-in. centers; and 17¾-in. swing, 51-in. centers.

These accurate, powerful lathes are equipped with built-in Westinghouse-Wise multispeed drives and controllers. They also possess the following special features: The spindle

speeds may be quickly and easily changed without stopping the motor. The controller starts, stops, or reverses the spindle. Thirty-two thread leads or feeds may be secured instantly by shifting levers. Additional and special leads and feeds may be obtained by changing quadrant gears. The lead screw has an extremely accurate continuous thread without a spline. There is an independent feed shaft with interlocking safety clutch.

Full information may be obtained on request.

The School Shop Shopping Guide

Price, Performance, Service

HOLD-HEET Glue Pots meet today's budget requirements; still out-perform all others—are accurate to 1°. Keep glue just right without attention. No water to boil dry. Mica Insulation prevents grounding (shock). Approved by Underwriters. Give trouble-proof service. (Some still in daily service after 15 years.)

Test a "HOLD-HEET" for 30 Days FREE

Try out a "HOLD-HEET" in your own classroom for 30 days. If it doesn't prove the best pot you have ever had, send it back. Write size and voltage.

RUSSELL ELECTRIC CO.
364 W. Huron St., CHICAGO, U.S.A
— Ask your Jobber —

Automatically Safe!

1 qt.....$14
2 qt.....$17
4 qt.....$24
8 qt.....$36
115 or 230 Volts

VINCENT'S ELLUMS

Vincent's Tracing Papers have no equal. Supplied in rolls and sheets of any size. Avoid substitutes. The label guarantees the quality. Samples gladly sent on request.

GEORGE VINCENT, INC.
251 WEST 19th STREET NEW YORK

ELECTRO-TYPERS

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

PEWTER AND BRITANNIA METAL

Sheets: 24"x36" or smaller
Circles: 2" to 24" diameter
Specify size and gauge.

NATIONAL LEAD CO., DEPT. P
New York Chicago St. Louis

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair, Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

E. B. & A. C. WHITING CO.
Burlington, Vermont

THE DIXON CLASS CARD
Arranged by John Dixon

An efficient class recording system arranged on cards, providing space for every possible record, in a manner that is unique in its simplicity and unusual as a time-saving device for the busy teacher.
Price, 40 cents

THE BRUCE PUBLISHING CO.
524-544 N. Milwaukee St. Milwaukee, Wis.

NICHOLSON FILES

Made to meet the conditions imposed on a file when it is in actual use.

At hardware and mill supply dealers'.

NICHOLSON FILE COMPANY
Providence, R. I., U. S. A.

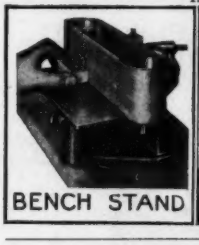
NICHOLSON U.S.A.

--A FILE FOR EVERY PURPOSE

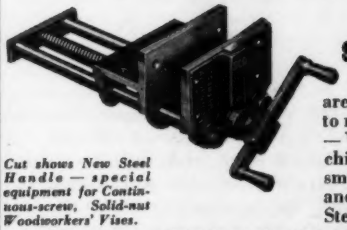
Now - Dustless Sanding

with new Take-About Sander. Quickly refinishes desks, tables, benches, blackboards. Pays for itself, also valuable on large shop projects, because belt insures smooth, flat surface. Four models to choose from. Bench Stand converts it into Edge Sander. Write for Porter-Cable bulletin and abrasive chart to-day. Ask about our 20 other machines. We cater to schools.

PORTER-CABLE-HUTCHINSON CORP.
1702 N. Salina St. Syracuse, N. Y.



COLUMBIAN VISES



Cut shows New Steel Handle — special equipment for Continuous-screw, Solid-nut Woodworkers' Vises.

For School Shops

Columbian Vises are made in a full range to meet every shop need — Woodworkers' — Machinists'—Pipe—Blacksmiths' — Utility Vises and also Drop Forged Steel Clamps.

Write for complete information

THE COLUMBIAN VISE & MFG. CO.
9017 Bessemer Ave. Cleveland, Ohio

THANK YOU

We desire to express our appreciation for your patronage. Our Eighteenth Annual Catalog of

"HARD-TO-GET" MATERIALS

will be waiting for you next fall. To obtain your FREE copy send us your name and mailing address now. Catalog will be mailed during the second week in September.

THURSTON SUPPLY CO.
Anoka, Minnesota